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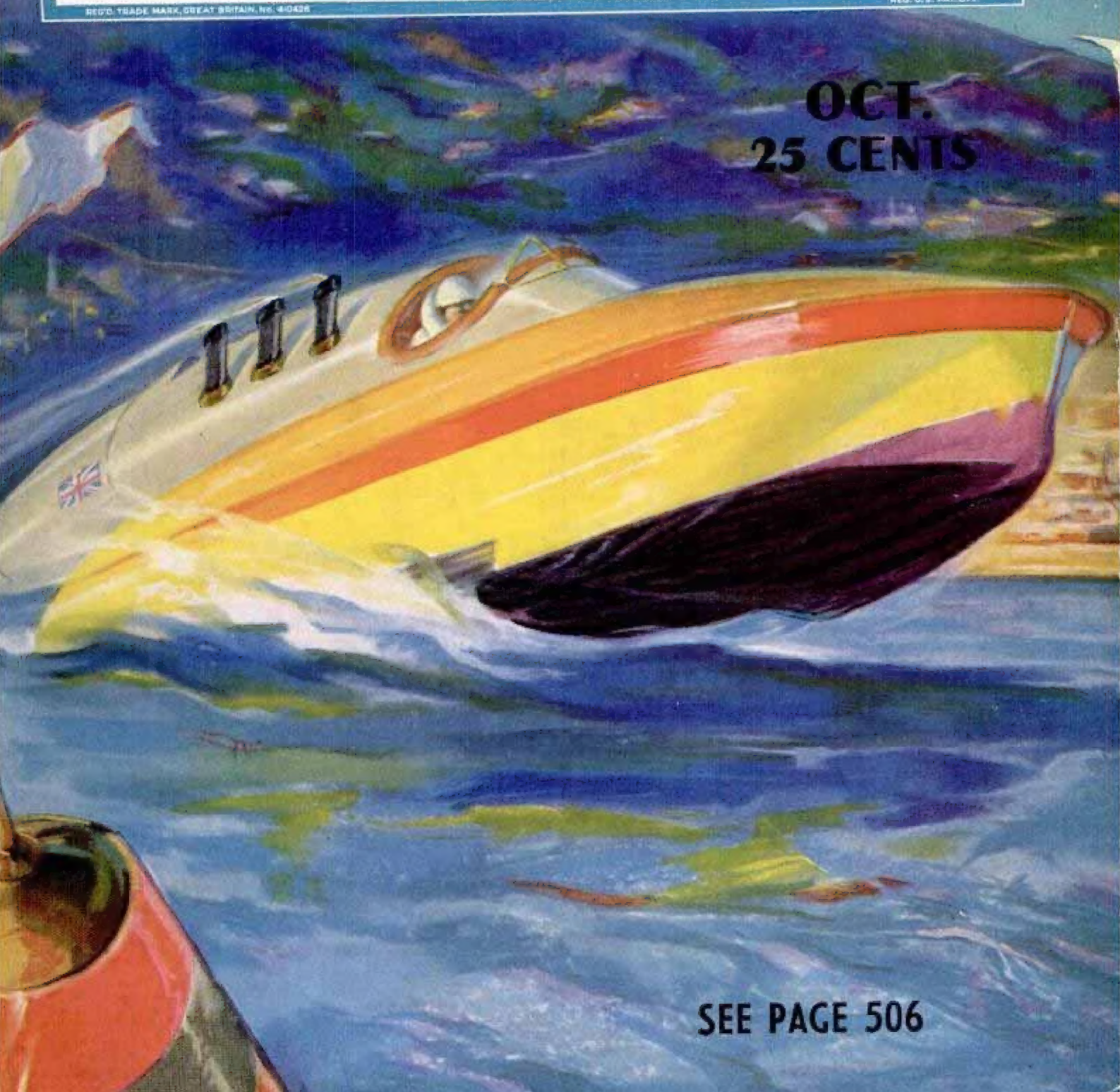


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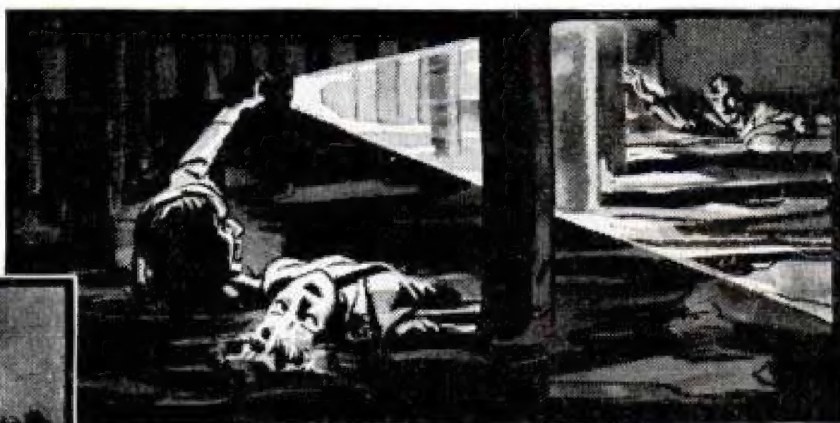
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Black Swirling Water Swept Her Out of Sight

Girl Leaps for Ferryboat and Misses: C. C. C. Rescuers Plunge Among Ice Floes



Harold Watson of 64 Scholes St. and his pal Joseph Flanagan of 717 Madison St., Brooklyn, N. Y., who were rewarded with C. C. C. Certificates of Valor signed by President Roosevelt.



"A girl came running down the dock as the boat pulled away. She jumped . . . and missed," writes Harold Watson, "falling into the icy swirling water. Standing as I was on the deck of the ferryboat with my buddy Joe Flanagan, I saw her swept under the pier while those on the dock couldn't tell where she was.

"One man had a flashlight but he didn't know where to shine it . . . I had to have it so I jumped back on the dock and dove after the girl with the flashlight in my mouth. I found her easy enough, but it was so cold in there amongst cakes of floating

ice I couldn't do more than just hold her up. It looked like we both would drown . . . I was ready to give up . . . when I realized Joe was shouting at me, saw him swimming toward us towing a life preserver. Thanks to him we got the life preserver under the girl and brought her out from under

the dock where soldiers in a life boat pulled us out.

"But if it hadn't been for that flashlight and those fresh DATED 'Eveready' batteries that kept the light burning in that icy salt water, there couldn't have been any rescue at all, for we never could have found the girl under that dock.

(Signed)

Harold Watson

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Popular Mechanics Magazine

H. H. WINDSOR, Founder

H. H. WINDSOR, Jr., Editor and Publisher

October, 1937

Vol. 68, No. 4

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Dynamite—Man's Mighty Slave

WITHOUT dynamite, our modern civilization would be impossible because it enters, directly or indirectly, into the making of nearly everything we use today. Without dynamite, you would be without an automobile or concrete roads on which to run it, without adequate fuel, without electrical power, perhaps without such a simple thing as an alarm clock. It has been one of the great constructive forces of the twentieth century and yet, despite its great service to mankind, dynamite is generally maligned and unappreciated. An article next month explains how this industrial explosive, one of the fastest and most powerful substances ever created by man, has altered the history of the entire world within the short space of half a century.

Next Month

IN THIS month's Coloroto section are pictured and described some of the architectural miracles of the ancient Mayas who built without metal tools, without machines, without modern structural materials. How did they do it? Part of the answer has been found in the ruins of their palaces and temples and is supplied in the second part of this article in the November issue.

Eyes That Never Sleep

ELECTRIC eyes today are performing more than 500 individual tasks contributing to your comfort and safety. They speed up and control automobile production, match colors, control temperatures, inspect razor blades and perform countless other tasks automatically, efficiently and silently. An article next month describes the important part the electric eye plays in industry today.

Flying Housekeepers

A YEAR or so ago air-line passengers ate cold lunches out of paper boxes. Today, from two-by-four "kitchens" without a stove or scarcely any other equipment, stewardesses bring forth full-course dinners, steaming food, gleaming silverware, stiff linen and china plates. And on sleeper planes at bedtime, berths appear as if by magic. An article next month explains how it's done.



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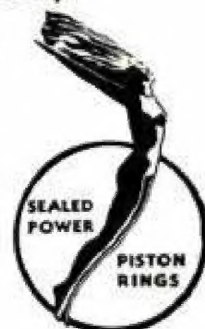
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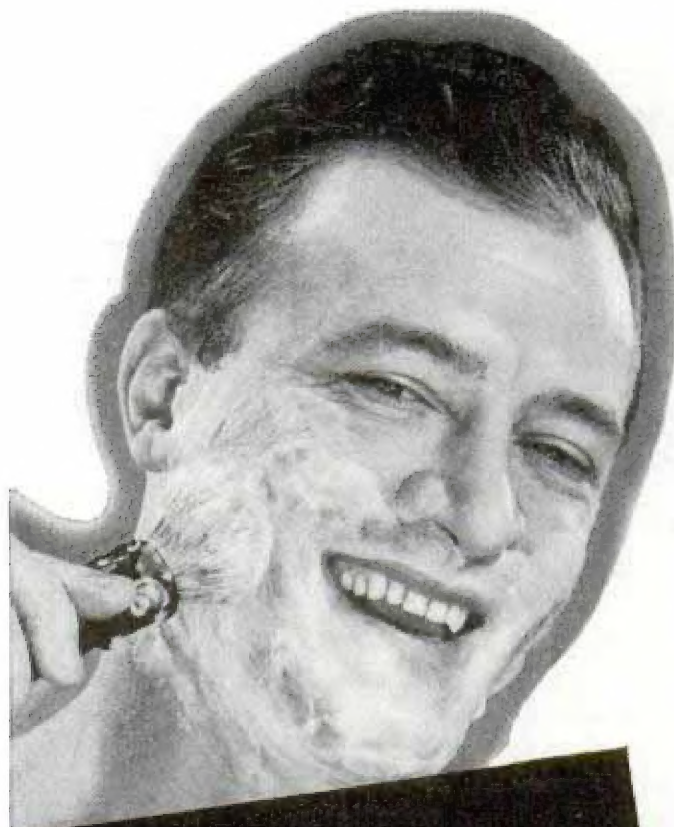
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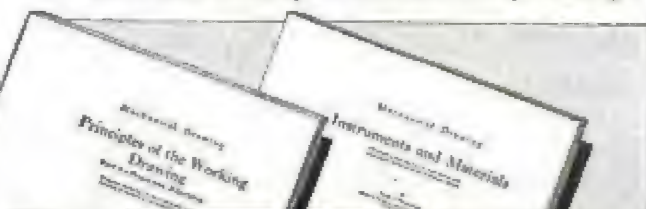
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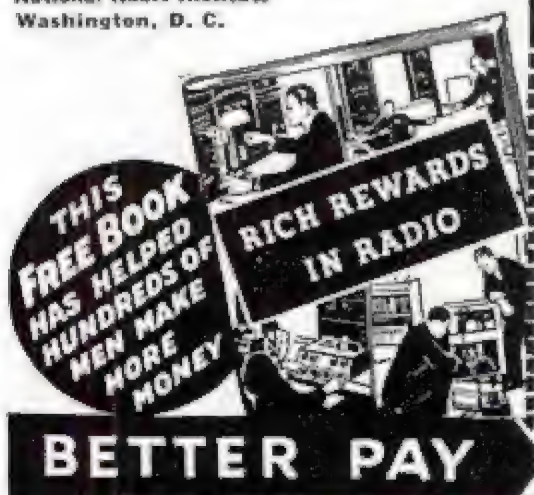
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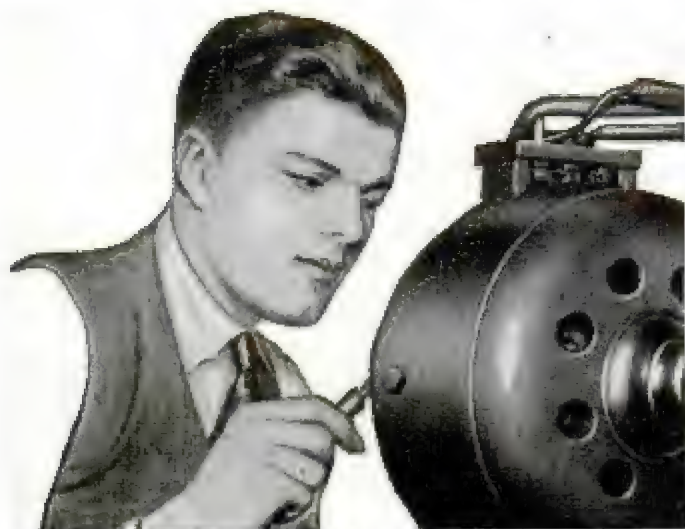
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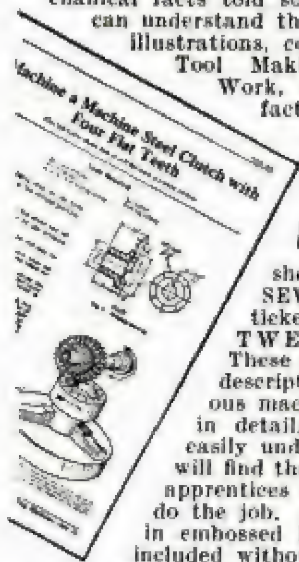
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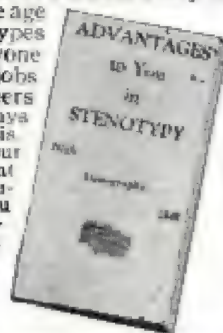
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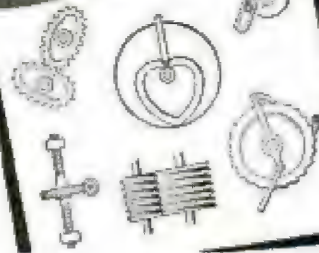


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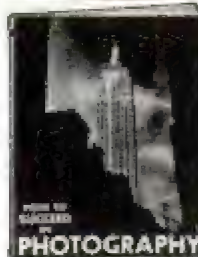
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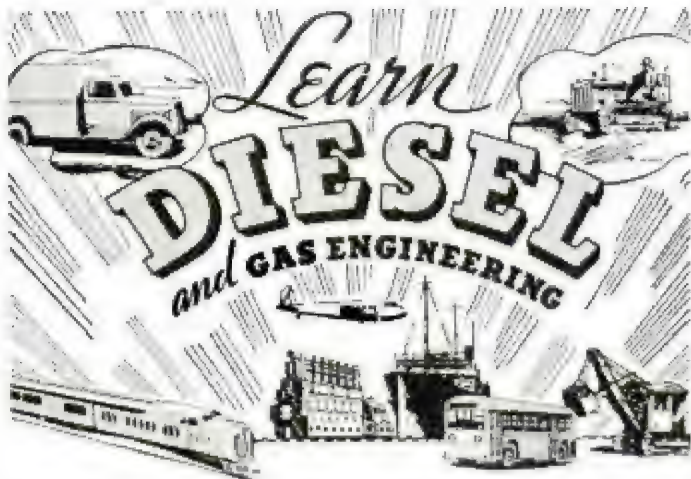
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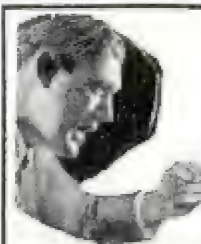
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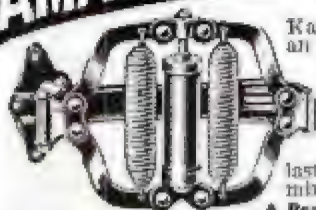
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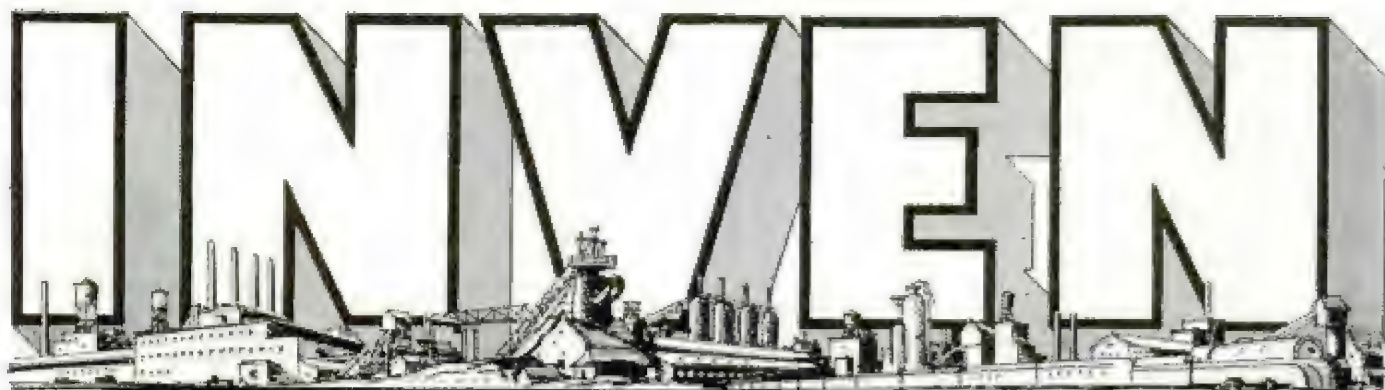
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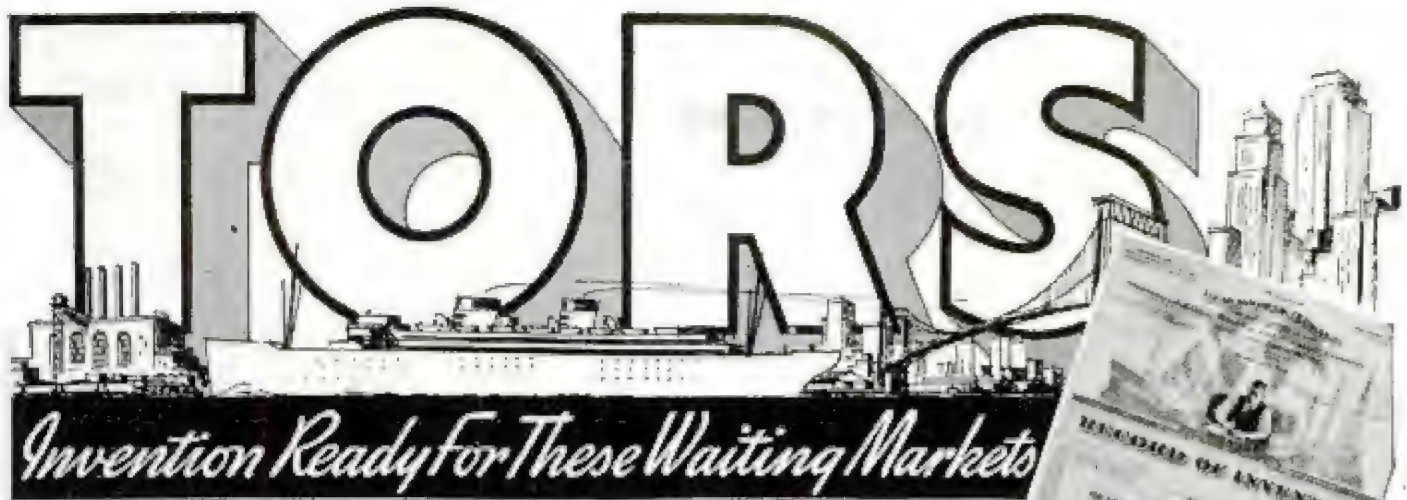
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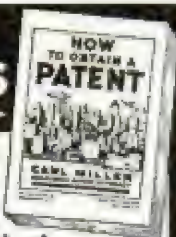
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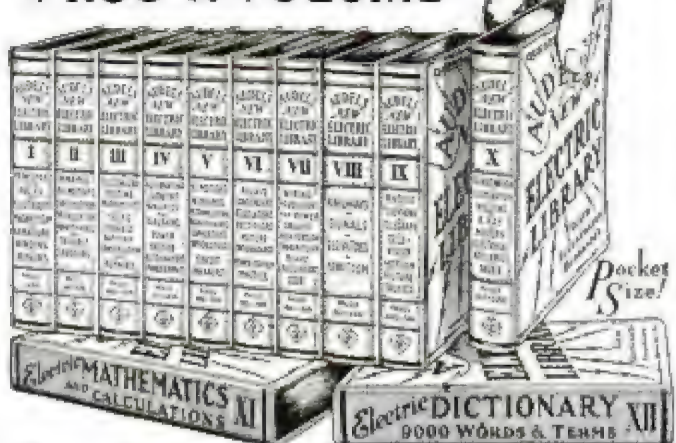


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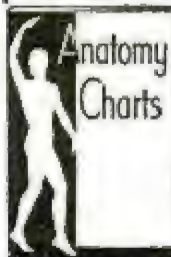
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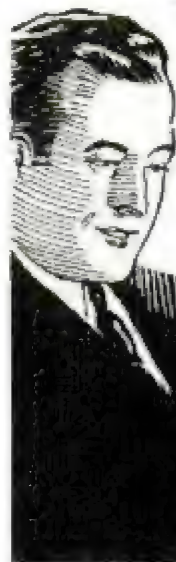


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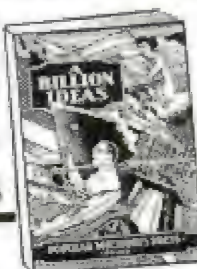
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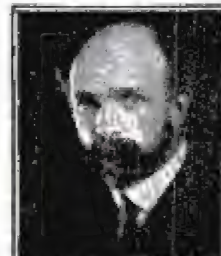
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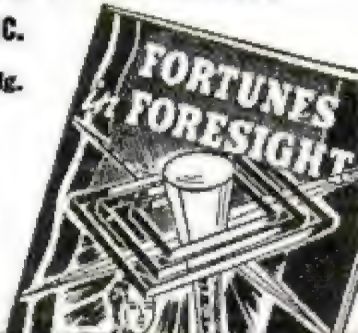
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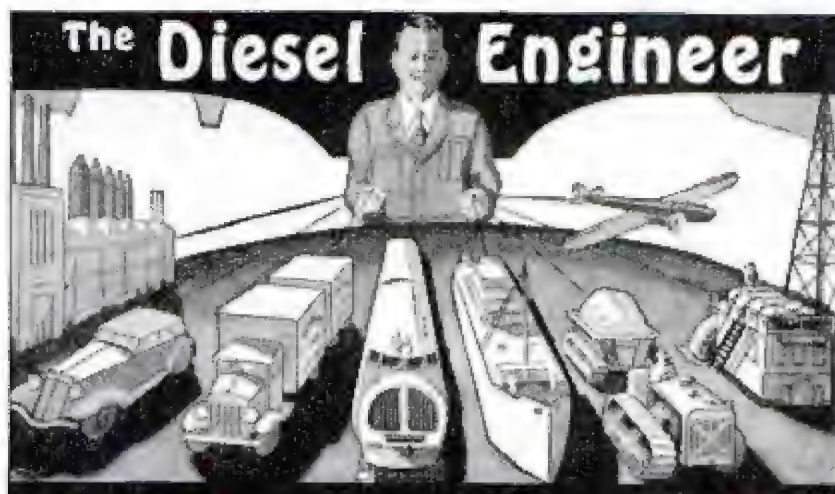
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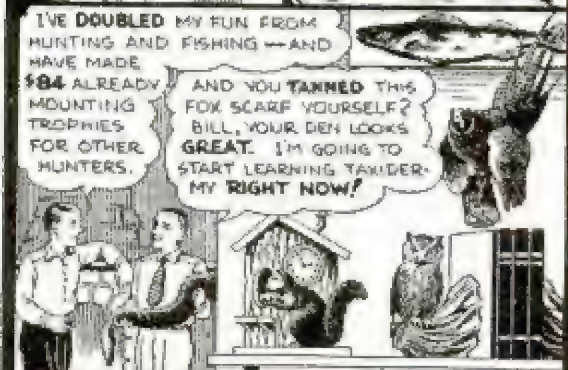
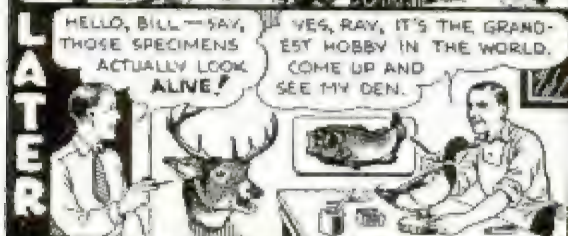
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Top row, left and right, Austrian navigation stamps. Center, two of French Equatorial Africa set. Center row, two French, one Japanese and two more French semi-postals. Bottom row, left and right, bilinguals. Center, New Guinea, Tangier and Australian issues

IN 1890, Great Britain commemorated the Jubilee of Penny Postage by issuing a special postal card bearing a one-penny stamp. This card was sold for six pence, the extra five pence being set aside as a fund for postal employees. The lifting of the lid of this Pandora's box has loosed a horde of stamp issues, but collectors have not fully accepted them as necessary parts of their collections.

These semi-postal, or charity stamps, for they usually have a charitable purpose behind them, must have a postal franking value if they are to be sold to stamp collectors at all. This is usually shown on the face of the stamp, and quite often it is followed by a plus sign and another value, which is the amount of surtax to be assigned to the charitable object. This sur-

tax often is only a small fraction of the postal value of the stamp, but there are notable instances, as in the case of the card cited above, where it amounts to several times the franking value. In many cases the stamps are commemorative as well as charity stamps, while in other cases they illustrate the charitable purpose which they are to assist. Charity stamps usually are placed on sale around Christmas when everyone seems less inclined to follow the budget, but in spite of this, stamp collectors pay more into the various funds than do the general public.

The first countries to follow the lead of Great Britain were New South Wales and Victoria, and both issued one-penny and two-pence half-penny stamps in commem-

(Continued to page 58A)

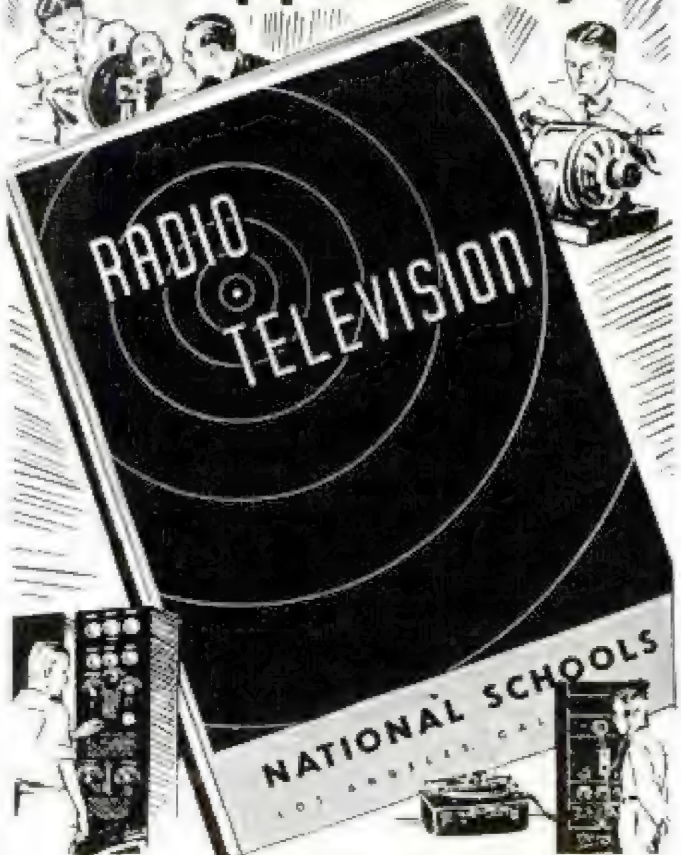
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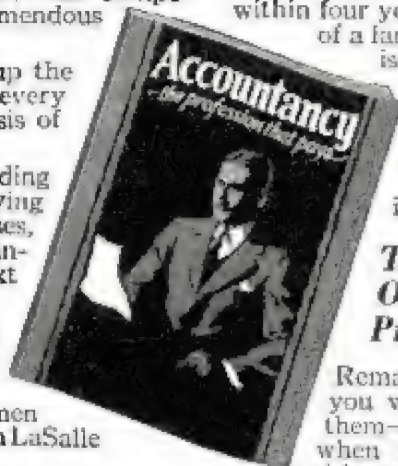
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JO BO Rubber bow ties. Excellent sideline. Jo Bo Products Co., 3402 School St., Des Moines, Iowa.

MEXICAN Feathered Christmas cards, gifts. Sensational fast sellers. Big profits. Free particulars. Samples 10c stamps. Marquez, Apartado 1176-F, Mexico City, Mexico.

BIG Profits. Neck Tie Cleaner. New idea and every man a prospect. Fast repeat business. Send four dollars for case twenty-four bottles. Retail 25c. Everybody buys. Radley Mfg. Co., Marion, N. Y.

JAY-WAY Door holder, sensational money-making. Jay-Way, One E. 42nd, New York.

NEONLIKE Day and night signs 3c, retail 25c. 1000 designs. Sample free! Lowy, Department 731, 8 W. Broadway, New York.

MAKE Big money with amazing new line pants, shirts, jackets, sweaters. Smashing low prices. Cash in advance commissions, in addition earn extra cash bonuses and your own garments. No investment. Complete sample line free. Rush name, address. Dunlapants, Dept. K-17, Cincinnati, Ohio.

MAKE Extra money spare time showing my "Exclusive Selections" \$1 assortment of Christmas folders. You make 50c a box. Seven other Christmas bargains. Engraved holiday stationery, 50c. Gift wrappings. Write free samples. Schwer, Dept. 210, Westfield, Mass.

YOU Can make money. Sell Glas-Glo. Fast mover. Wonderful repeater. Big profits. Many home and garage uses. Sample (enough for 100 windows, windshields) 3 cents. Glas-Glo Co., Dept. 107, Phelps, N. Y.

\$1 CHRISTMAS Card assortments. Cost only 33c. Contains 25 folders. Write Champion Greetings, Box 696, Atlanta, Ga.

CHRISTMAS Cards—50 beautiful fold-ers, name imprinted, cost 65c. sell for \$1. Marvelous 21-folder assortments sell for 80c and \$1, pay you 100% profit. Samples free. Rush inquiry; get started quick! New England Art Publishers, North Abington, 356, Mass.

LORD'S Prayer engraved on penny. Sample 10c. Barrington Sales, Barrington, N. J.

1 MONTHLY Maintains New York of-ice. Co-operative Mail Service, 126-A Lexington Ave.

AGENTS—To mail our literature. Good profits. Home business. Maywood, 148 Fifth Ave., New York.

QUICK Cash profits selling perfumed Xmas cards. Perfume novelties. Particu-lars free. Sample 10c. Mission Co., 2328W Pico, Los Angeles, Calif.

ROUTE Men wanted. Local grocery routes paying up to \$45 in a week. Auto-mobile given producers as bonus. Write Albert Mills, 2459 Monmouth, Cincinnati, Ohio.

THE One motion Kendall Envelope Seal-er sells on demonstration at \$2.50. Seals 50 a minute. Kendall Co., East Jaffrey, N. H.

SUCCEED With your products. Make-sell them. Formulas, Processes. Accurate analyses. Catalog free. B. Thaxly Co., Washington, D. C.

DISTRIBUTORS—Supply revolutionary corn remedy to stores. New plan results in landslide of orders. 150% profit. Exclusive franchise. Reliable Specialty Corp., Buf-falo, N. Y.

PROFIT With new products. Make, sell, repeat. Analysis, Research. Guaranteed formulas. Biggest catalog free. Special prices, leads. Gibson Laboratory, Chem-ists, BD-1142 Sunnyside, Chicago.

THYDRO-X (Extra miles). Tremendous market! Up to 500% profit! 25% to 50% increase guaranteed! Trial offer free. Thermo-P Works, Peoria, Ill.

PATENTED Gillette sharpener. Instant demonstration. Particulars free. Sample 50c. Mercer, 101 W. 75 St., New York.

AGENTS Make \$5000 a year! New low priced fire alarm that sells on sight! No wiring needed. Every home and farm needs from 1 to 6. Biggest money maker of all time. Write for details today! The Muter Co., 1251 S. Michigan Ave., Chicago.

1059 WAYS To start a profitable busi-ness. Get Popular Mechanics book of mod-ern formulas and methods for practical specialty manufacturing. Price only \$1.25 postpaid. Popular Mechanica Press, Room (C37), 200 E. Ontario St., Chicago.

BIG Money and fast sales. Every owner buys gold initials for his auto. You charge \$1.50, make \$1.45. Ten orders daily easy. Write for particulars and free sample. American Monogram Co., Dept. 40, Dun-ellen, N. J.

AGENTS: Smash go prices. Santos coffee 12c lb., 4-oz. vanilla 87c. Razor blades 10 for 87c. 100 sticks chewing gum 12c. Christmas cards, 21 in box, 14c. 150 other bargains. Premiums. Experience unneces-sary. Carnation Co., PO. St. Louis, Mo.

MAKE Your own products. Employ agents yourself. Toilet articles, soap, ex-tracts. We furnish everything. Valuable book free. National Scientific Laboratories, 1950W Broad, Richmond, Va.

AGENTS—Opportunity to make money; book containing 107 successful business plans; home or office; send for free intro-ductory booklet. Elite Co., 214 Grand St., New York.

NEW Brush plating outfits for auto parts, reflectors, etc., connect to a battery, no tanks used. Almost as simple as paint-ing. Good income plating and silvering mirrors, low cost. Free proof. Gunmetal Co., Ave. H, Decatur, Ill.

BIG Money applying gold initials on au-tomobiles. Easiest thing today. Free sam-ples. Also, sideline salesmen for name plates and tire cover transfers. "Balco," 1305 Washington, Boston, Mass.

GENUINE Gold letters for store win-dows. Easily applied. Free samples. Lib-eral offer to general agents. Metallic Let-ter Co., 438-B No. Clark, Chicago.

FREE Sample—Amazing cleaner; sells homes, taverns, everywhere. Big profit—fast repeater. Betco, 5007 Irving Park, Chicago.

WANTED—District purchasing agents. No experience or money required. Write Purchasing Manager, 174 N. Halsted, Chi-cago.

DO You want agents for your proposi-tion? Your ad in this space will place your message before hundreds of men seeking fast-selling products. My folder "How to Secure Agents," is filled with proof. I'll gladly send you a copy free. F. W. John-son, Manager Classified Advertising, Popu-lar Mechanics Magazine, 200 E. Ontario St., Chicago.

KANTFREEZE, 8th Wonder. Makes ra-diators laugh at zero. Only anti-freeze in crystal form. Absolutely harmless. Every automobilist, prospect. Trial sample 25c. Kantfreeze Co., Sta. B, Cleveland, Ohio.

BIG Money taking orders; shirts, ties, hosiery, underwear, raincoats, dresses, etc. Sales kit free! Experience unnecessary. Write Nimrod, Dept. B, 4922-28 Lincoln Ave., Chicago.

MANUFACTURE Specialties, hire agents yourself. Big money. Free literature. Oil-bert Supply, 1107-P Broadway, New York.

ENGRAVED Name plates, numbers, signs, etc., easily sold, profits large. Brett Bros., Winthrop, Mass.

AGENTS: Stamping names on pocket-key protectors. Sample check with your name, address, 25c. Stamping outfits. Emblem checks, check-fobs, name plates. Hart Mfg. Co., 303 Degraw St., Brooklyn, N. Y.

HIGH-GRADE SALESMEN

MAKE Big profits in new kind wholesale business. No investment to start. Show merchants how to double profits and beat 5c-10c store competition by amazing new plan. Handle nationally advertised line 200 daily necessities, including Laymon's aspirin, approved by Good Housekeeping Bureau, advertised in Saturday Evening Post. Sold from flashing self-help counter displays in 5c-10c packages. Make up to 112% profit. Facts free. World's Products, Dept. 19810-B, Spencer, Ind.

AMAZING Invention closes all doors si-lently, automatically. New oil principle. Easily installed. Never needs attention. Priced dollars less than other checks. Un-limited market stores, offices, factories. Free demonstrator furnished workers. Kant-Siam, Dept. X-62, Bloomfield, Ind.

SELL Sanitary products to jails, asy-lums, schools, hotels, factories, contrac-tors, hospitals, etc. Complete cooperation and protection, plus large commission. Prominent Specialty Co., 509 Fifth Ave., New York City.

MAKE Money fast! World's largest man-ufacturers of patented "sealed" trade cards and sealed coupon business stimulator games for all retail stores, beer taverns, service stations, etc. Easy to sell on our 90 day money back trial plan. Brand new foot ball deal, base ball, mystery star, secret panel, etc. Also 4 big lines of gorgeous art calendar subjects. Advance commis-sions, 36c in stamps brings you prepaid great big \$5 value sales manual. Worth-more, Inc., Dept. P107, 221 E. 20th St., Chicago.

WANTED—Men for good paying work with a large shoe company. Good pay ev-ery day. Free shoes as bonuses to "go-getters." No experience needed. Complete sales outfit sent free. Write Consolidated Shoe System, Dept. M6, Chippewa Falls, Wis.

MERGER Of two largest direct selling shirt companies creates greatest money making line ever assembled. Shirts, ties, hose, underwear, new features, new fab-rics. Guaranteed one year. Daily cash profits, extra cash bonuses. Outfit free. Dept. P-10, Roseliff-Quaker, 1239 Broad-way, New York.

SALESMEN: Take orders, business sta-tionery \$2.65 thousand, book matches, ad-vertising pencils, shelf moulding, labels, salesbooks, pricing sets, tear-off business cards. 35c comm. daily. Free deals. Sales portfolio free. David Lionel Press, 312 S. Hamilton, Dept. TV, Chicago.

BIG Commissions selling stores celluloid pricing tickets, metal shelf moulding, menu covers, signs, chrome changeable letters. P. Pricing Press, 134 White St., New York.

SELL Nothing! \$95 weekly. \$500,000 punchboard firm announces new, no in-vestment plan. Season starting. K&S, Dept. C130, 4329 Ravenswood, Chicago.

IMMEDIATE Openings for ambitious men! Wear, introduce "Fairbanks" tai-lored-to-measure clothes, make up to \$10 in a day. Experience unnecessary. Bonus suit offer. Low prices. Quick sales. Free outfit. Permanent! Fairbanks Co., 2307-A Wabansia, Chicago.

500% PROFIT! Gold reflecting letters for store windows. Large sizes 1c. Free samples. Modernistic Sign, B-3000 Lincoln Ave., Chicago.

NEW Punchboard assortments. Free large colored catalog. Nothing to carry. Larger cash commissions daily. Season now! Addwill Sales Co., 180 Adams, Chi-cago.

SALESMEN, Sell calendars, complete line, all sizes, including jumbos; beautiful subjects. Samples free! Flemming Calen-dar Co., 6543 Cottage Grove, Chicago.

NATIONALLY Known calendar-novely manufacturer wants experienced salesmen for new framed Glasscraft Mirrors. Big-gest seller in years. Ad-Nov-Co, Newton, Iowa.

DON'T Be a job hunter. Start your own business on our capital. No hard times; no lay-offs; always your own boss. Hundreds average \$3,000 to \$5,000 annual sales year after year. We supply stocks, equipment on credit. 200 home necessities. Selling experience unnecessary. Wonderful oppor-tunity to own pleasant, dignified, profit-able business backed by world wide indus-try. Write Rawleigh, Dept. J-U-PPM, Freeport, Ill.

YOUR Own business! Become a sub-scription representative for "Popular Me-chanics." No capital needed. Liberal com-missions. Monthly bonus. Write for de-tails. Circulation Department, 200 E. Onta-rio St., Room 403, Chicago.

STEADY Cash income selling Ajax shoes with double safety feature! Benefits any workman; saves foot injuries and mon-ey. Your own shoes at discount. Anderson Shoe Co., Grafton, Mass.

CALENDARS: Excellent sideline; lowest prices; big commissions daily; kit free. Examiner, 2917 W. Lisbon, Milwaukee, Wis.

BLADES. Factory prices. Free delivery. National Blade, D-5-A, Rochester, N. Y.

NEW Invention. Snow scraper that fas-tens to bumper of car. Cleans drive in few minutes. Service stations and car owners all buy. Write for territory. Bumper Snow Scraper Co., Box 963, Des Moines, Iowa.

MANUFACTURERS Representatives wanted. Exclusive territories for quality line of babbit metals sold to industrials, large commissions. Repeat item. A \$5 re-turnable deposit required for samples. Bonnell Allen, Railway Exchange Bldg., Chicago.

BIGGER And quicker profits selling Firex—Automatic Fire Extinguisher and Alarm. Low price assures sales. Recom-mended by fire chiefs, insurance men, etc. Unlimited prospects, generous commissions. Write for territory and testimonials. Firex Corporation, Dept. K-103, 516 S. Broad-way, St. Louis, Mo.

EARN Big money distributing our amaz-ing self-selling wristwatch punchboards. Send 10c for starting outfit. Hurry! Gair, 1922 Sunnyside, Chicago.

TIRE Accessories. Guaranteed 10,000 mile Tiger Grip Tire Patch, and complete fast-selling line auto accessories. Sales-men-distributors easily make up to \$75 weekly, and over. Protected territory. Economy Rubber Products Co., 830 Burk-hardt, Dayton, Ohio.

SENSATION Of 1937. Embossed leather neckties. Gorgeous silk-like patterns. Long wearing. Wrinkle proof. Damp cloth cleans. Sell on sight, 100% profit, free ties. Sample tie, selling kit 35c. Plan free. Royal Tie, Box 1306, Dept. 121, Milwaukee, Wis.

YOUR Own suits and overcoats free and other attractive bonuses plus big cash profits, for selling fine quality all wool tailored to individual measure clothes. Five popular low price ranges. Exclusive sport styles at no extra charge. Prices defy competition. Amazing range new fall and winter all wool patterns. Satisfaction or money back guaranteed by reliable twenty-eight year old tailoring firm. No experi-ence needed. Sample outfit free. Jay Rose & Co., Dept. P-10, 330 S. Wells, Chicago.

IMAGINE Going into stores, gas stations, etc., empty-handed and coming out with money in your pocket. New, powerful pro-gressive sales stimulator. Merchants going for it. Fast, advance cash commission get-ter. Automatically repeats. Sales outfit free. Meinhardt, Dept. B-7, 18 E. Kinzie, Chicago.

BIG Advertising book match factory of-fers salesmen amazing full or part time opportunity. Big commission. G. B. made \$77 in 1 day. Fast repeater. Free kit. Match Corp. of America, Dept. E-10, 6041 Grand, Chicago.

BE Your own boss. Make the largest commissions selling our complete line of brushes. Write for sales plan. Wire Grip Sanitary Brush Corp., 220 Southern Blvd., New York.

SELL Aspirin, laxatives, laces, blades. Write National, Box 500-K, Cincinnati.

BRUSH Salesman—If you ever sold brushes write for our money making proposition. Donald Brush Co., Camden, N. J.

NEW Specialty—Sells every business and professional man. Four \$15 sales daily pay \$280 weekly. Ferrell cleared over \$1,000 monthly. Write, F. E. Armstrong, President, Dept. PM, Mobile, Ala.

FREE Booklet describes 107 plans for making \$20-\$100 weekly, in home or office, business of your own. Elite Co., 214 Grand St., New York.

SPARKLING Olo-Brite signs sell fast to stores, restaurants, taverns. Lasting gold finish. Plenty profit. J. A. Baxter, Cambridge, Ohio.

BIG Money taking orders: shirts, ties, hosiery, underwear, raincoats, dresses, etc. Sales kit free! Experience unnecessary. Write Nimrod, Dept. 65, 4922-28 Lincoln Ave., Chicago.

SALARY And bonus offered salesmen after proving ability, selling business men. Small investment, returnable. Non-competitive product. Engineer, Box 1814, Tampa, Fla.

HELP WANTED

WANTED: Scrap copper, brass, aluminum. Star Metals, 3216 Berceau, Chicago.

USE \$500? Raise canaries for us. Splendid sparetime money maker, fascinating work. We supply singers and buy back. Write for free particulars. Crimmins, Box 44B, Woodside, N. Y.

EDUCATIONAL AND INSTRUCTION

AIR Conditioning, electric refrigeration industries demand trained men for installation, service, maintenance and sales. Quality in 3 months. Free employment service. Established 34 years. Get new book "Step Up to Success" free. Write O. Werwath, President, 1020-G N. Broadway, Milwaukee, Wis.

SHORTHAND Simplified, complete \$1 folder-lesson 10c. Simmons, Rocky Hill, Conn.

MEN Wanted willing to learn landscape designing and fill big paying position as landscape architects. Free test of your natural ability and chance to win in \$750 contest. No experience needed to start. Earn while you learn. Write today for free test blank. American Landscape School, 837 Plymouth Bldg., Des Moines, Iowa.

"UNCLE Sam" jobs. Start \$105-\$175 month. Prepare immediately for next announced examinations. Experience usually unnecessary. Full particulars—list positions, free. Write today. Franklin Institute, Dept. H3, Rochester, N. Y.

SECRET Investigations. Excellent opportunity. Particulars free. Write George Wagner, M-2640 Broadway, New York.

BIG Bargain catalogue educational matter 10c. Handling, Y-799 Broadway, New York.

SHORTHAND Brings opportunities. Catalogue mailed. Shorthand Institute, 6230 Clayton, St. Louis.

BECOME An Investigator—Secret service agent. New "Test Problem Method." Develops your ability. Particulars free. International Secret Service Institute, (PM107), Hoboken, N. J.

LEARN Roof gardening. Plan free. Art Garden Co., Napoleon, Mich.

MILWAUKEE Industries desire to contact earnest men to learn electric arc welding in their laboratories of the School of Engineering. Moderate training fee. For details write President Werwath, 1020-F N. Broadway, Milwaukee, Wis.

BEGINNERS Instructed for Florida hotel positions. Lee Institute, Drawer 1706, Boston.

DRAFTSMEN—Increase income anywhere from \$100 to \$1000. Introductory "how" material 25c. Draftsmen's Foundation, 24 Ekater St., West Medford, Mass.

BE Independent. Learn shoe rebuilding, hat cleaning, clothes pressing. Practical experience. Investigate now. Low tuition. Quisias Institute, 2917 Broadway, Chicago.

STAMMERING Corrected at home. Machon, 3063 W. Pico, Los Angeles, Calif.

BE A radio announcer. Learn at home. Free information. Write: Radio Arts Academy, 3823 Wilshire, Hollywood, Calif.

LEARN To write. My simplified lessons assure success. Particulars free. Expert Penman, Box 104, Pasadena, Calif.

500,000 USED Technical and business books. Sold, rented, exchanged. All subjects. Satisfaction guaranteed. Cash paid for used books. Complete details and illustrated bargain catalog free. Send name. Nelson Co., 4013 Wrigley Bldg., Chicago.

LEARN Welding. Build your own arc welder from old automobile generators. Send \$1 for certified instructive plan. A-Welder's Club of America, Box 3432, Chicago.

LEARN Machinist trade, tool, die making. Automatic and hand screw machines. Modern shop methods. Actual work. Jobs open for trained men. Employment help. Illustrated booklet free. Allied Screw Machine Co., 601 Lake St., Chicago.

HOME Study engineering courses leading to degrees. Mechanical; electrical; Diesel; civil; aeronautical; automotive; chemical; radio and others. McKinley College of Engineering, Chicago.

GET \$50 To \$87.50 every pay day on Uncle Sam's payroll. Many appointments expected soon. Our coaching helps qualify you for Social Security, liquor gauger, meat inspector, office clerk, stenographer, typist, customs, postal and many other positions. Write today for free book, list of positions, etc. Patterson School, (Arthur R. Patterson, former Government examiner, Principal), 8 Case Bldg., Rochester, N. Y.

MAKE More money. Get a U. S. government job. Get our new plan for obtaining one—no obligation. Age 18-50. Write Instruction Service, 101, St. Louis, Mo., immediately.

BECOME Business investigator. Make money in your spare time. Pleasant work, good fees. Details free. Business Detective System, 1009 Oak, Elmira, N. Y.

BLUEPRINT Reading taught by mail. Write Blueprint Reading Institute, Box 5662, Metropolitan Sta., Los Angeles.

LEARN Auto mechanics, body, repairing, welding, electricity, refrigeration, Diesel. Stevenson's, 2008A Main, Kansas City, Mo.

MASSAGE, Hydrotherapy, dietetics, drugless therapeutics, chiropody, taught by mail. Evans Correspondence School, Montgomery, Ala.

LEARN Air conditioning—America's next big industry. Thousands of opportunities. Get your start with complete book by E. W. Riesbeck. \$3.50 postpaid. Popular Mechanics Press, Room (C37), 200 E. Ontario St., Chicago.

PLAYS—STORIES—MANUSCRIPTS

SHORT Stories revised, typewritten, marketed. Details free. Hursh Service, Box P-1013, Harrisburg, Penna.

CARTOONING, COMMERCIAL ART, SHOWCARD WRITING, SIGN PAINTING

WORLD'S Simplest method show card, sign writing. Earn while learning this fascinating trade. Complete course, 12 lessons. Special offer, first lesson \$1. Money back guarantee. Particulars free. Evco, 818 N. Clark, Chicago.

CARTOONING Course \$1: Simplified home study course, 30 lessons, over 500 illustrations, drawing pens, and pencils. \$1 complete, postpaid. Scovell Studios, Box 748-P, Hollywood, Calif.

ATTRACTIVE Modern signs easily painted with Speedway Patterns. Experience unnecessary. Excellent results. Extremely low cost. 3-in. alphabet, 10c. Free samples, literature. Display Letters Co., Station 235-G, New York.

LEARN Lettering \$1 complete course. Northeastern School of Lettering, Bangor, Maine.

ART Magazine free. How to paint, model, carve, cartoon, draw human figure, etc. How and where to sell, exhibit, form art clubs. Instructive. Two 3c stamps bring sample. Artist, 18 E. 48, New York City.

SILK Screen process. See our ad under Painting Outfits. Artset Co.

LEARN To draw and paint. Finely printed and illustrated book containing 110 pages 60c postpaid. Hanft Publishing Service, 516-U Federal St., Pittsburgh, Penna.

SIGN Painters make big money. Why not you? Simple, easy to learn. Signs are used everywhere. Circulars for stamp. The Russ-Well Institute, Box 27, Geneva, N. Y.

FREE! Make rapid-fire sketches of pretty girls! It's easy, with "Stencil-Art" charts. No obligation, just send stamp "Stencil-Art." Brookhaven, Ga.

EARN cash income, copying and duplicating simple cartoons for advertisers. 3-M Service, Argyle, Wis.

BRUGMANN'S Cartoon Review on vaudeville trick cartoons consisting of chalk stunts, comic strips, photographs tabloid, political cartoons. Free details. Brugmann's Cartoon Studios, Bedford, Ohio.

ADVERTISING AGENCIES—FOR ADVERTISERS

LEARN Advertising quickly at home. Easy practical plan. No text books. Common school education sufficient. Interesting booklet and requirements free. Page-Davis School of Advertising, 3601 Michigan Ave., Dept. 3431, Chicago.

DISTINCTIVE Letterheads designed, \$2.25. Drawings. Advertisements prepared. Wilford Glatfelter, Springvalley, Ohio.

SIGNS: Attractively painted colors 10 feet long, yard wide, paper, \$1 post paid. Write, Edwards, Galena, Ill.

200 WORD Advertisement in Keystone flyer, displayed. National circulation 25,000 copies and 1000 copies of your advertisement printed on circulars for you to mail only \$5. Samples 10c. Morrisco, 2138 N. Carlisle, Philadelphia.

ADVERTISE Profitably: \$15 reaches 6,000,000 Sunday newspaper readers with 24 word ad. Newspaper, magazine, rate-guide, free. Chicago Union Agency, 20 W. Jackson, Chicago.

FREE—New Advertisers Rate Guide, 44 pages. Includes everything. Lowest rates. E. H. Brown Advertising Agency, 140 S. Dearborn, Chicago.

ADVERTISING Placed anywhere. Helpful, free service. Rate guide book free. Baker Advertising Agency, 189 W. Madison, Chicago. Successors to Ankrum Advertising Agency. Established 27 years.

ADVERTISE: 5 Lines 100 national mail order publications \$4. Lists free. Advertising Bureau, 4515-G Cottage Grove, Chicago.

INCH Display advertisement 30 magazines year \$24. Wood's Popular Services, Atlantic City, (N. J.)

BUSINESS SERVICE

RELIABLE Information, any subject, \$1. American Business, 79 Madison Ave., New York.

WASHINGTON, D. C., mail address. For business or personal purposes. \$2 monthly. Hawkins Mail Service, 817 Fourteenth.

CHICAGO Address for your business, personal mail, \$1 monthly. Letters, etc., forwarded daily. Established nineteen years. Dependable. General Service, 56 W. Washington.

TYPEWRITERS, DUPLICATORS, OFFICE DEVICES

PRINT Your circulars, bulletins, etc., in attractive colors with the Vari-Color duplicator, \$29.75 complete. Single color duplicators \$4.95 and up. Illuminoscopes (great aid for preparing stencils), \$4.95. Vari-Color Duplicator Co., Dept. X, Ottumwa, Iowa.

NEW \$3.75 Automatic adding machine. Full, guaranteed. Bassett, Box 302D, Altadena, Calif.

OFFICE Machines, typewriters, adding machines, duplicators, etc., 29 different makes, care and operation of. Only book on subject. 384 pp. illus. \$2.50 postpaid. Popular Mechanics Press, Room (C37), 200 E. Ontario St., Chicago.

TYPEWRITERS, Duplicators, multi-graphs. Write for free list office machine bargains. Save half. Pruitt, 518 Pruitt Bldg., Chicago.

INCREASE Business now. "Excelligraph" Rotary Stencil Printer reprints thousands everything you typewrite, hand-write, draw or trace. Colors. \$19.75 to \$44. Terms. Illustrated literature free to business or professional men. Pittsburgh Typewriter Supply, Department K-2, Pittsburgh, Penna.

RUBBER STAMPS AND OFFICE SUPPLIES

CUSHION Mounted. one-two lines 25c, three 35c; facsimile signatures \$1.50. Stamp Works, 814 Bradley, Peoria, Ill.

NAME, Address, 2 lines 25c; 3 lines 35c. Stamp Works, Auburn, Nebr.

2 LINES 25c, 3 Lines 35c. Stamp Works, Centerport, N. Y.

SPECIAL! 2 Lines 35c. Knob handle. Owl, 6452 Kenwood, Chicago.

DE LUXE Stamps, 2 lines 25c; 3 lines 35c. Stamp Works, Hastings, Nebr.

PRINTING, MULTIGRAPHING, MIMEOGRAPHING, GUMMED LABELS

LEADER Quality, 250 bond 8 1/2 x 11 letterheads and envelopes, \$2. "Little Business Builders" our specialty. Thomas Wood, Massena, N. Y.

ENGRAVURE Printing—500 each letterheads, envelopes \$3.75 prepaid. Lambert Brothers, St. Petersburg, Fla.

250 LETTERHEADS, 250 Envelopes \$1.50 postpaid. Bennetville, 907 W. Roosevelt, Philadelphia.

SUPERB Printing at lowest prices. Buck, 2497 Telegraph, Berkeley, Calif.

COLORFUL Modern labels, priced right. Samples. 6618F Quimby, Cleveland, Ohio.

1000 PRINTED Cards \$1 postpaid. Business Cards, 237 S. Lancaster, Dallas.

250 8 1/2 x 11, 20 L.B. Letterheads, 250 6 1/2 x 9 envelopes, \$2. Victoria Press, 137 Front, Exeter, N. H.

ENGRAVURE Printing, lowest possible prices. Samples free. Sunco, Mohawk, N. Y.

250 EACH Letterheads, envelopes, only \$2.25. Pricelist. Moffett Printing Co., Bloomfield, Ind.

300 STATEMENTS (Or letterheads), 300 envelopes \$2.50, 1,000 cards \$1.50. Postpaid. High quality. Samples. Imperial Press, Norman, Okla.

PRINTING—All kinds, quality work. Low prices. Samples free. Michaels Press, Box 103-c, Station W, Brooklyn, N. Y.

HAMMERMILL Bond letterheads, 6 1/2 x 9 envelopes, billheads, invoices, statements, \$3.89 per 1000 postpaid. Service bond \$2.92, 1000 postpaid. McCall Printing Co., 1326 S. 27th, Omaha, Nebr.

1000 6x9 CIRCULARS, Letterheads, envelopes, postcards, \$2.95; 5000, \$8.99. All printing reasonable. Samples. Cuts. Goodprint, Harrisonburg, Va.

FIFTH Avenue quality stationery; premium; samples. Green, 444 W. 58th St., New York.

LABELS: All kinds. Write, samples. JBSCO, Box 93, Holyoke, Mass.

500 ENVELOPES \$1; 5000, \$7.50. Poling Press, Elkins, W. Va.

FREE. 200 Envelopes with order 250 letterheads 8 1/2 x 11, \$2 prepaid. Evans, 44PM N. Tenth, Reading, Penna.

BUSINESS Cards, 1,000, \$1, post free. McBride Printery, 646 McBride Ave., Los Angeles, Calif.

6x9 CIRCULARS, Letterheads, envelopes, postcards, \$2.75, 1000. Sewellprint, Wilmore, Ky.

500 GUMMED Stickers, four lines, 25c. Cotti's Press, Spickard, Mo.

MATCHES—1,000 Books \$4.50. Advertise your business! Send printing instructions. Sanderson's Book Matches, Ottawa, Ill.

QUALITY Printing, estimates, samples free. Lindeman(?) 161 Hamilton, Albany, N. Y.

GREATEST \$1 Printing specials in country. United Printing, Pottstown, Penna.

FREE—Portfolio of samples. Attractive prices! Sanderson's Printing, Ottawa, Ill.

95c BUYS 1,000 3x6 Circulars in two color ink; 500 3x6 blotters; or 1,000 letterheads; plus \$1 collect. Hardy Printing, Bad Axe, Mich.

500 3 1/2 x 2 1/4 FOUR Line gummed stickers, 25c. Moritz Printery, Saginaw, Mich.

FREE—Fine quality fountain pen, pencil and knife set with every \$5 printing order. We can save you money. Get our offer before ordering printing elsewhere. Coleman's Service, Smithboro, N. Y.

QUALITY Printing, Lowest prices. Samples. Tucker Press, Box 63, Indianapolis.

PRINTING OUTFITS AND SUPPLIES

NEW Type 29c font. Catalog dime. National Type Co., Jackson, Mich.

HAND Presses, type, supplies. Send stamp for catalogue. Printers Sales, 114 S. Howard St., Baltimore, Md.

HAND Presses, new type, supplies. Lists 3c. Landis, Richland, Penna.

HAND Press, type and complete printers' supplies. Advise equipment you need and we quote prices; or send stamp for catalog. P. Peiffer, 22-B; 6 Columbia St., Newark, N. J.

BUILD Roller press. Instructions 50c. Circular for stamp. Box 513-E, Center Moriches, L. I. New York.

SILK Screen process. For showcards, signs, displays, etc. Decorating toys, furniture, novelties. On paper, cardboard, wood, metal, other products. Easily learned. Complete instruction. Particulars free. Artset Co., 637 Case Bldg., Rochester, N. Y.

PRINT Your own cards, stationery, circulars, advertising. Save money. Easy rules furnished. Print for others, big profits. Junior outfit \$8.85; job presses \$11 up. Details free. Kelsey Co., B-11, Meriden, Conn.

BARGAINS, Presses, type, List 3c. Exchange D-15, 23 Orient, Meriden, Conn.

PRINTING Outfits—Presses, type, supplies, type novelties. Send 20c for card case samples. Catalog free. Model Press, York, Penna.

BARGAINS—Presses, type, supplies. Send stamp. 159 Harvard, Cambridge, Mass.

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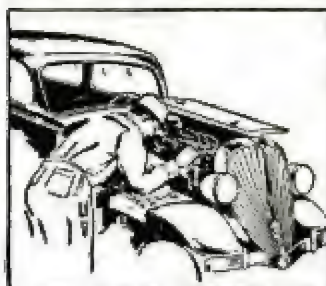
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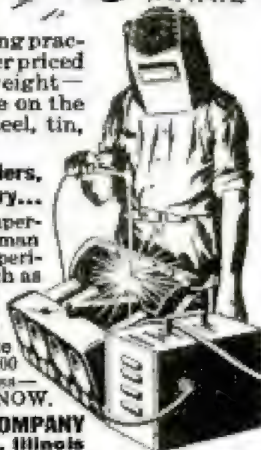
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| <input type="checkbox"/> Reading Shop Blueprints | <input type="checkbox"/> Surveying and Mapping |
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| <input type="checkbox"/> Telephone Work | <input type="checkbox"/> R. R. Locomotives <input type="checkbox"/> Air Brakes |
| <input type="checkbox"/> Mechanical Engineer | <input type="checkbox"/> R. R. Signalman |
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| <input type="checkbox"/> Inventing and Patenting | <input type="checkbox"/> Coal Mining Engineer |
| <input type="checkbox"/> Patternmaker | <input type="checkbox"/> Navigation <input type="checkbox"/> Boilermaker |
| <input type="checkbox"/> Heat Treatment of Metals | <input type="checkbox"/> Textile Overseer or Supt. |
| <input type="checkbox"/> Bridge Engineer | <input type="checkbox"/> Cotton Manufacturing |
| <input type="checkbox"/> Gas Engines <input type="checkbox"/> Diesel Engines | <input type="checkbox"/> Woolen Manufacturing |
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City.....State.....

Occupation.....

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(Continued from page 40A)

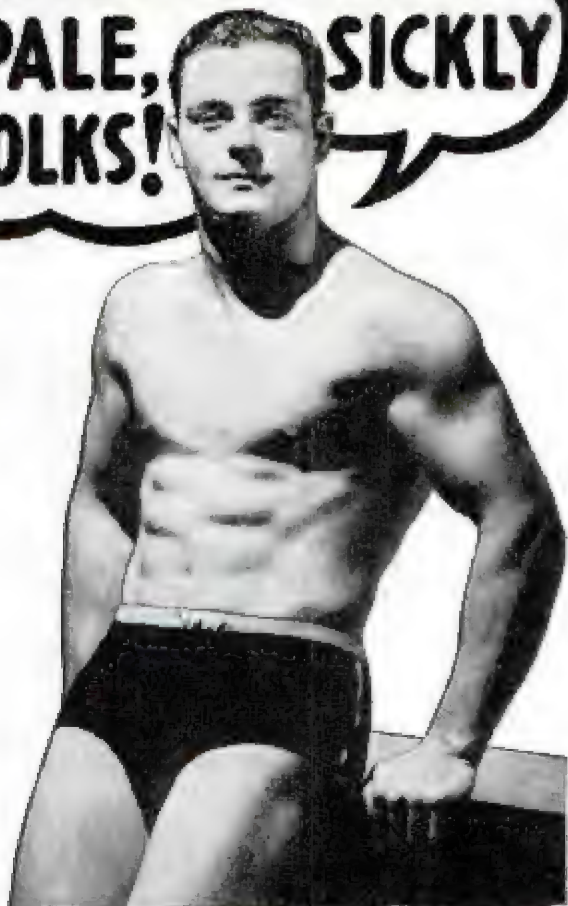
oration of the diamond jubilee of Queen Victoria in 1897. These stamps were sold at one and two shillings each, or about twelve and ten times face, respectively. Those of New South Wales, in addition to being commemorative, and for charity, are the first issued to aid in fighting tuberculosis. Today about fifty nations issue tuberculosis stamps or seals, but the greater number of these are without postal value, and do not come within the field of philately. In 1900, Queensland and Victoria issued one and two-pence semi-postal stamps, which sold at one and two shillings with the premium going into a fund in connection with the Boer war. In 1905 Russia brought out a set of four values to raise a fund for orphans of Russian soldiers killed in the Russo-Japanese war. Netherlands and Roumania started long lines of charity stamps in 1906, and in the following year the British colony of Barbados, in the West Indies, used a semi-postal stamp to raise funds for earthquake sufferers in Kingston, the capital of the neighboring colony of Jamaica. A large number of countries adopted semi-postal stamps as a means of obtaining various funds during the world war, and by 1921 about forty countries were represented. Up to the present time about sixty nations or colonies have issued charity stamps. In 1926 Spain issued semi-postal air-mail stamps and since that time Morocco, the Dominican republic, Italy and many of its colonies have added this source of income for charitable purposes. A complete collection of the many semi-postal stamps would make an interesting set of albums.

United States Notes

Stamp presses of the United States continue to pour out a stream of commemorative stamps for various worthy causes. August had two issues, the first being a five-cent light-blue stamp issued upon the 350th anniversary of the birth of Virginia Dare, first English white child born in America, and the other being a souvenir sheet issued in connection with the forty-third annual convention of the Society of Philatelic Americans. The Virginia Dare stamp was placed on first-day sale at Mantoe, N. C., on August 18, and the souvenir

(Continued to page 66A)

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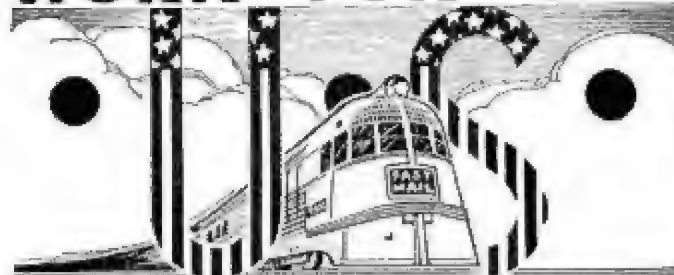
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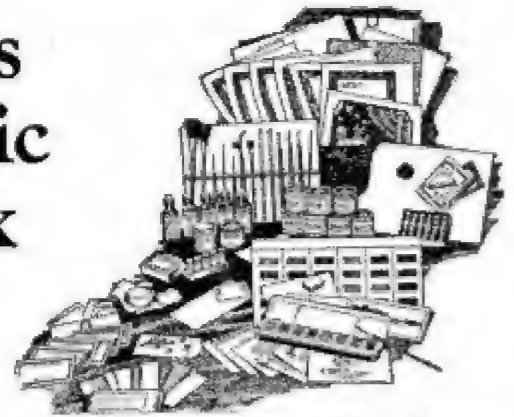
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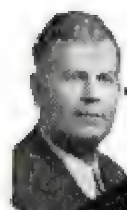
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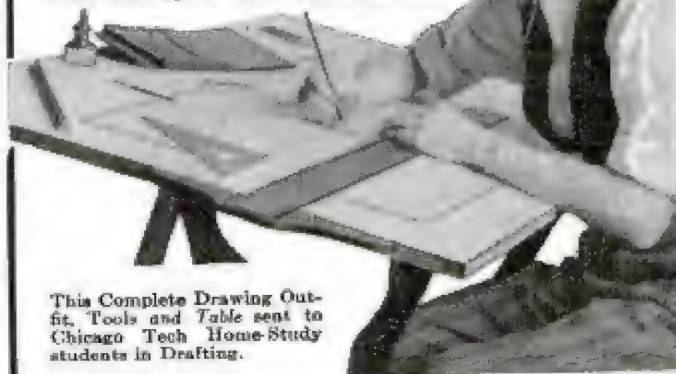
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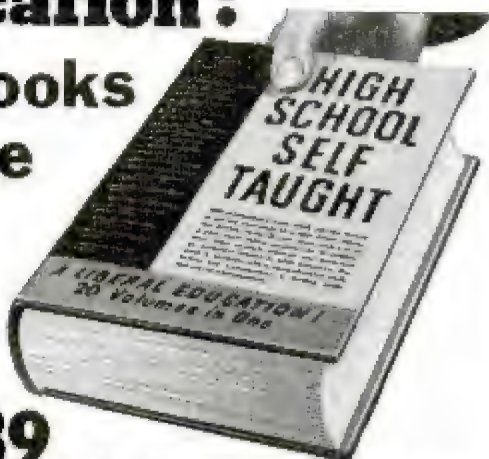
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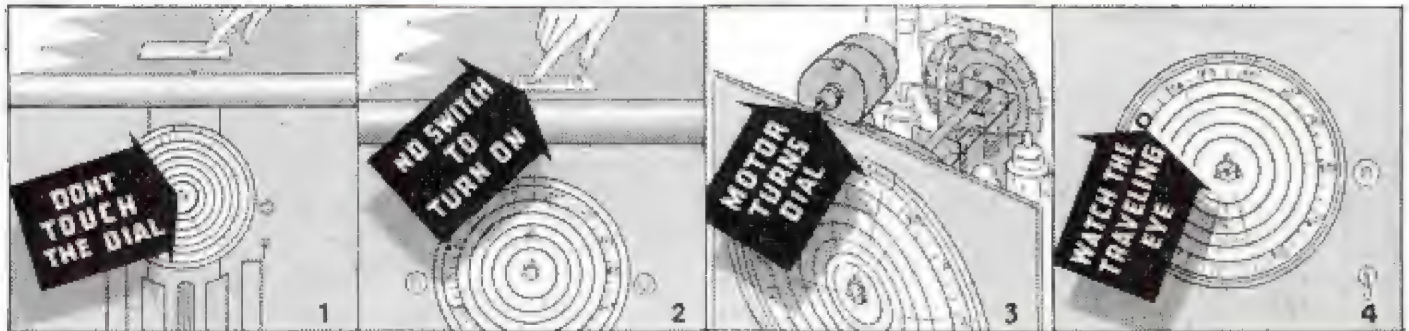
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Zip . . . Zip . . . Zip . . . you can bring in 9 perfectly tuned stations in 3 seconds! *All this happens in 1/2 second with Midwest Perfected Motorized Tuning!* (See above illustration). (1-2) You touch button; (3) Electric motor speeds dial towards corresponding station; (4) Colorful Bull's Eye darts across dial and locates itself behind station; (5) Dial stops itself at the station's exact center of resonance and the eye "winks" as program comes in perfectly tuned.

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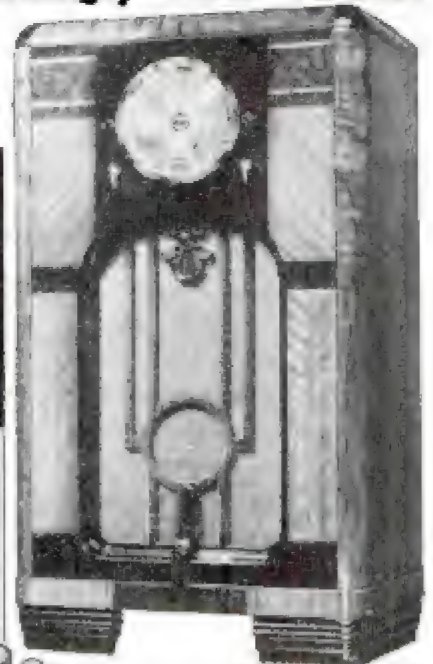
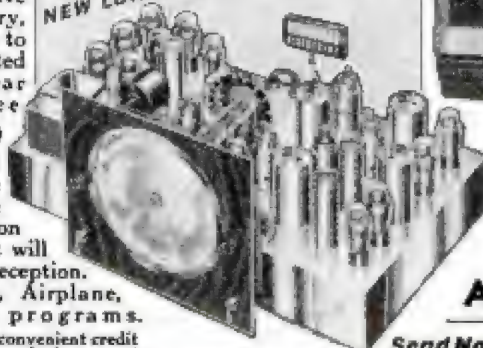
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(Continued from page 58A)

sheet which showed a reprinting of a single copy of the ten-cent Smoky Mountain National parks stamp, in green, on an imperforate sheet with appropriate inscription surrounding the stamp, was placed on first-day sale at Asheville, N. C., on August 26. This sheet must be obtained through the Philatelic agency of the post-office department at Washington, D. C.

A three-cent stamp will be issued, on September 17 to commemorate the Constitution of the United States. Unless there is a change in plans the stamp will be bi-colored, and will be placed on first-day sale at Philadelphia. The first design of the series of stamps to advertise the territories and possessions of the United States, has been approved. This design is for Hawaii and will show a portrait of the last king of the Sandwich Islands. The presidential series of stamps is being seriously considered at the present time, and a competition for the one-cent value has been announced. This will bear a portrait of Washington, with the dates of his tenure of office, and awards totaling \$1,000 will be given for the three best designs. This is the first time that American artists have been invited to submit their ideas for United States stamps.

New Stamp Issues

Although collectors relax a bit during the summer, there seems to be no let-up in new stamp issues. The George VI coronation stamps from the remote dominions and dependencies have finally arrived in this country so that it is now possible to fill orders for complete collections of these interesting commemorative stamps. The illustration shows some of the newer coronation stamps in the bottom row, as well as stamps of the regular issues. At the left is a bilingual pair from South West Africa, and at the right a similar pair from the Union of South Africa. These countries issue stamps with the inscriptions in English and in Afrikaans, alternate stamps being in one language or the other. Collectors find that it is necessary to save pairs in order to have a complete collection. The territory of New Guinea has been missing from most coronation stamp collections, and there was a rumor that most of the stamp supplies had been lost in

a tropical hurricane. The Australian stamp is not a coronation issue, but part of a new regular series. The central stamp in bottom row is one of the new British set surcharged for use in Tangier, in Morocco. The top row shows two examples of a three-stamp set issued by Austria to mark the 100th anniversary of the Danube Steam Navigation company. The two central stamps in the top row are part of a long set issued for French Equatorial Africa to replace the stamps of Chad, Gabon, Middle Congo and Oubangui Chari. In the center of the second row is one value of a Japanese semi-postal issue to raise funds for civilian aviators. At the left are two French semi-postal stamps issued for the benefit of needy professional folk. These show the portraits of Auguste Rodin, the sculptor, and Anatole France, author. At the right are two more French semi-postals, the surtax of which goes to further the sports activities of French postal employes.

Condition in Coins

Rarity largely determines the value of a coin, while age is a minor factor. The condition, or state of excellence, of a coin affects the price to such a degree that uncirculated specimens may be worth from two to five times as much as extremely fine coins and the latter may have about the same ratio to fair or good coins, all otherwise identical as to dates and mint marks. The numismatic scale of condition is expressed in the following terms:

Proof—Hand-finished coins struck on specially polished blanks. Not issued for general circulation but made to order.

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Extremely Fine—Practically uncirculated, but perhaps luster dimmed.

Very Fine—Very slight signs of wear. No scratches.

Fine—Signs of wear on the highest parts. No nicks or scratches.

Very Good—Noticeable wear, but every part of the coin distinct.

Good—Well circulated, but none of the inscriptions worn off.

Fair—Quite worn but still shows enough to identify.

Poor—Any coin below "fair" in grade.

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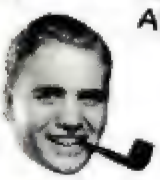


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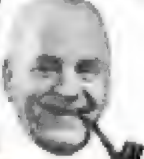
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Vol. 68

OCTOBER, 1937

No. 4

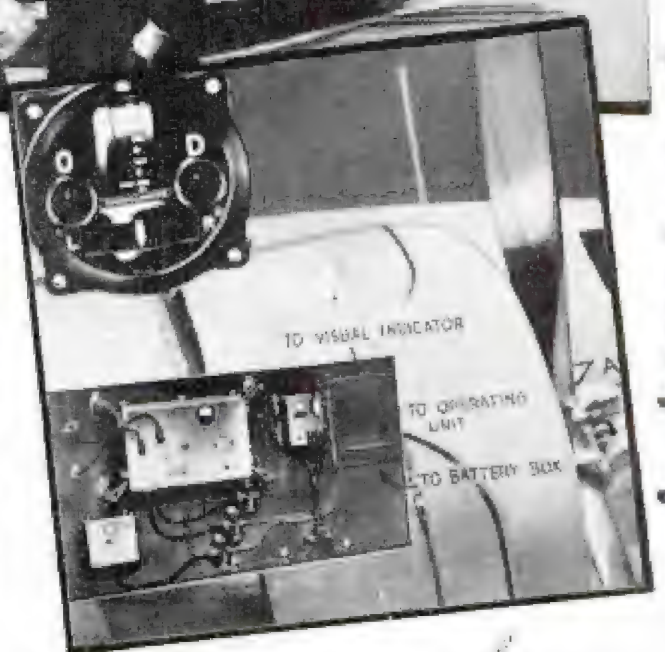
BENT BEAMS Speed BLIND LANDINGS



WHAT aviation experts regard as a foolproof system of blind landing has been devised and perfected by the combined efforts of several transport companies and related industries. Thus, complete conquest of that last frontier in the battle against fog and storm is in sight.

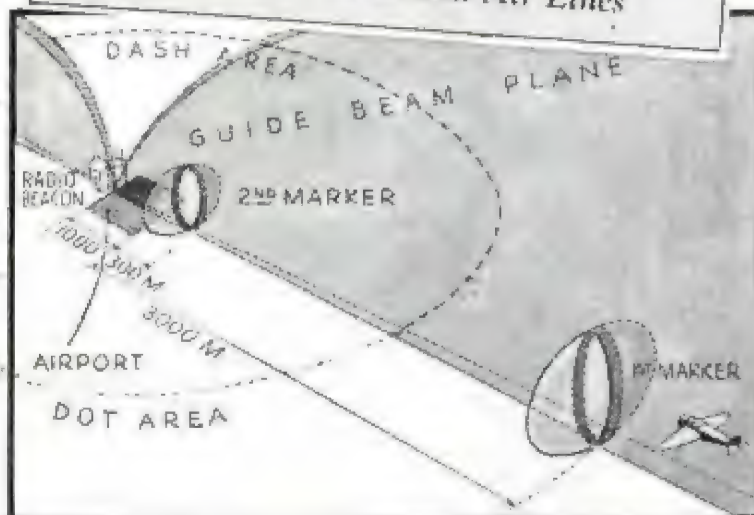
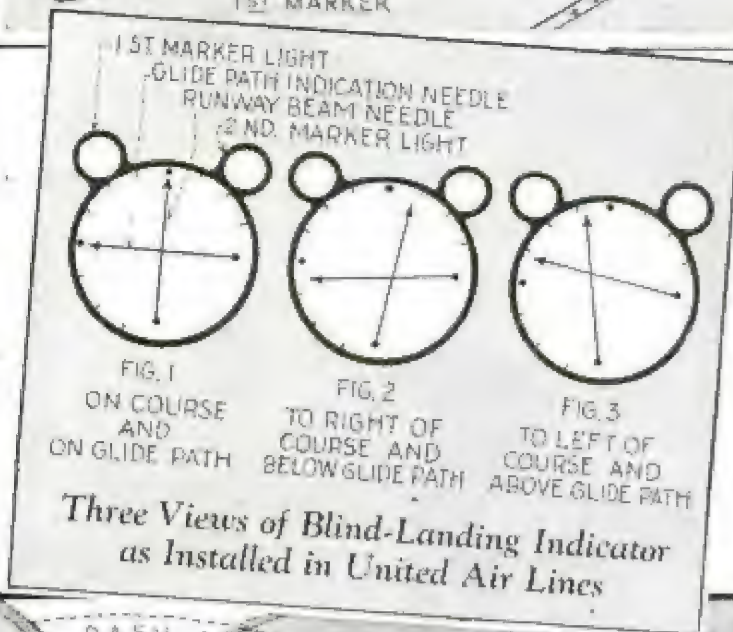
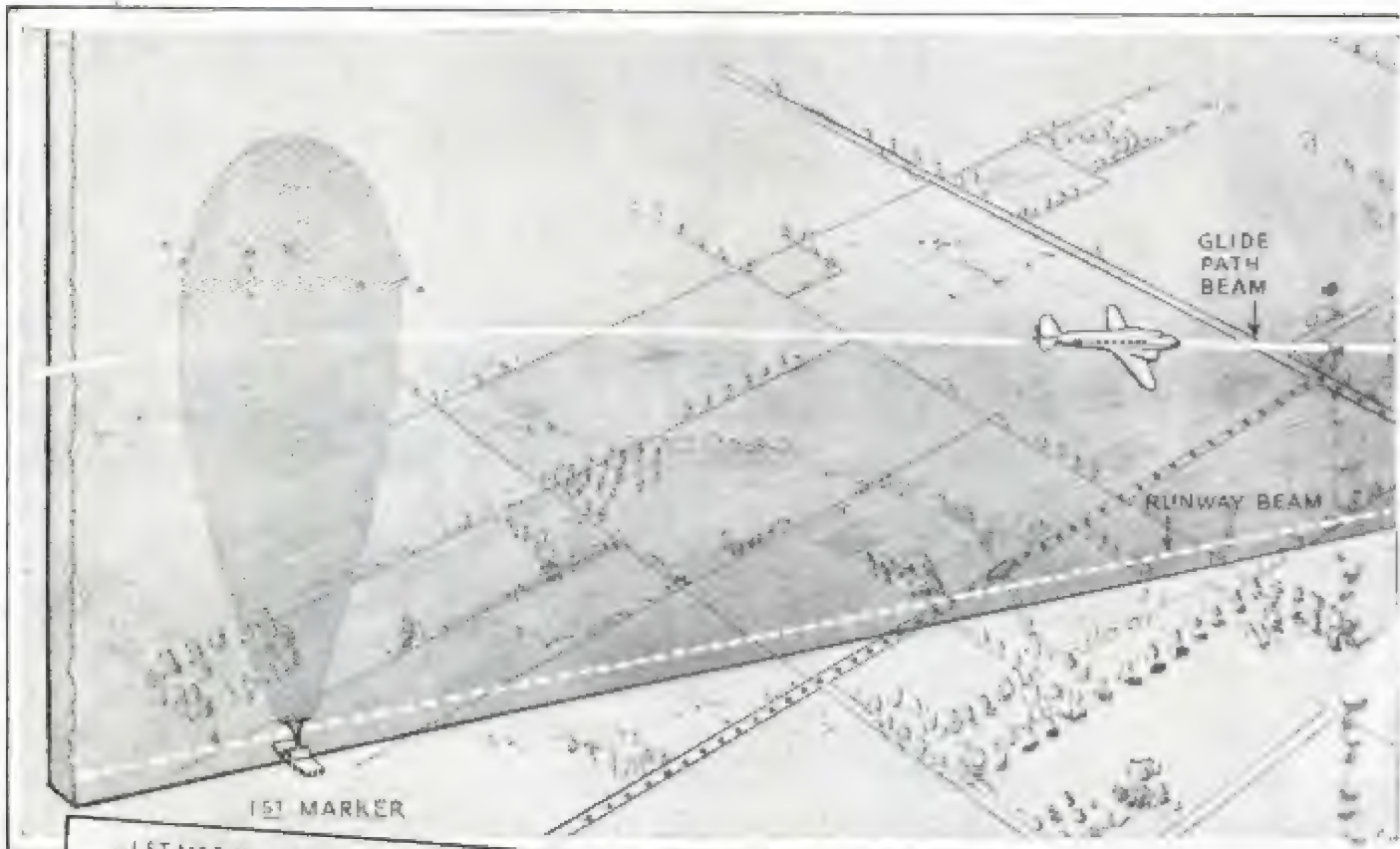
The system utilizes established principles of radio beam transmission, but in ultra-high frequencies, and combines a sloping beam with a horizontal directional signal and two vertical marker beams. These are coordinated to lead a descending airplane to the correct landing position at any airport where the transmitting equipment has been installed.

Visualizing the invisible radio signals,



Top, cross-type antenna mounted on nose of flight research plane. Bottom, the Lorenz visual indicator used in flights at Indianapolis

United Air Lines

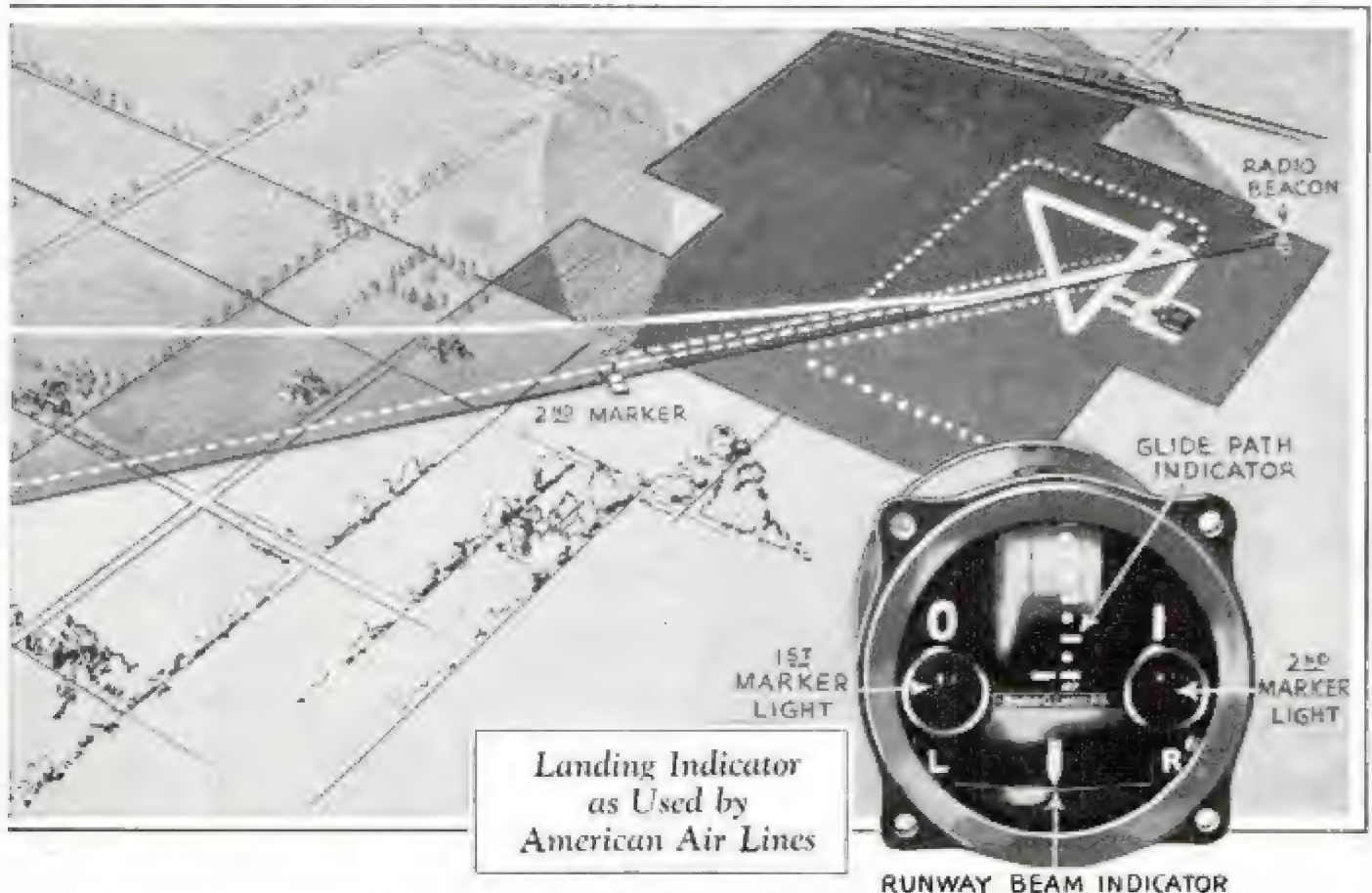


Center, indicator in three different positions. It is actuated by signals from airport. Bottom, pattern of glide and directional beams and the two marker beacons

Above, on this page and that opposite, how the blind-landing system would appear if it were possible to see the three kinds of radio signals which help the pilot to land. Pictured are the glide path, directional beam and marker beacons

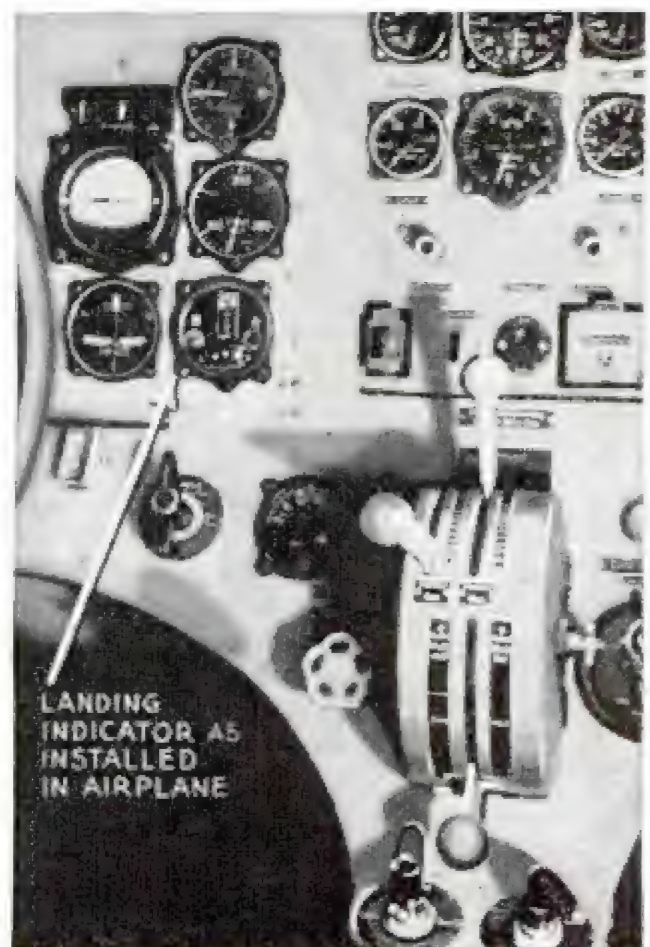
they would first take the form of a gently sloping hillside leading down out of the sky and to the airport. In this hillside is grooved, by a signal from a second transmitter, a sharply defined pathway leading to the center of the airport runway and continuing down the center to the end of the runway. And, along this path is a third identification in the form of signals projected straight upward, forming signposts along the path so that it is possible to determine at intervals exactly how far it is to the end.

This, in brief, is the basis of principles laid down by leading aeronautical experts at a conference where the results of years of individual research were pooled and specifications for a universal system of blind landing were mapped out and agreed on. Three fundamental points form the basis for the invisible pathway in the sky. These are: (1) The glide path,



which is made up of radio waves transmitted to follow in pattern the path taken by an airplane in its glide earthward for landing; (2) The directional radio beam, or localizer, which guides the plane so that while it is descending it will be directly on the course of a runway for landing; (3) The marker beacons, which are radio stations transmitting a beam of certain recognizable characteristics straight upward from the surface and which are spaced at intervals prior to actual point of landing. With the combination of the three, and by special instruments in the airplane, a pilot in the process of landing knows that he is descending at the proper landing angle, in a glide which will land his plane gently; that another beam is guiding him on a straight directional course which will land him dead-center on the runway, and what his horizontal distance is from the end of the landing runway.

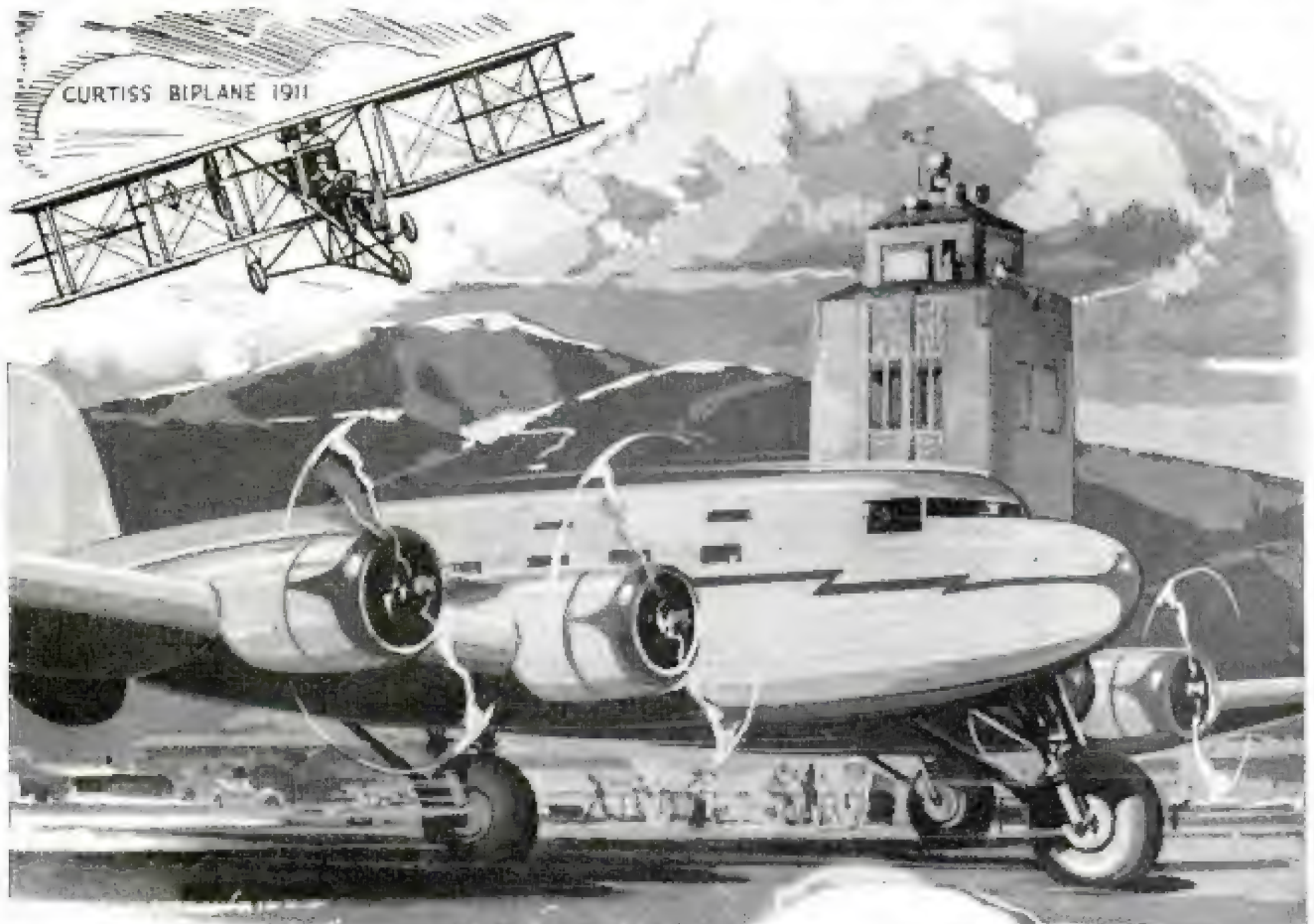
By these means the goal of 100 per cent uninterrupted air transport operations is declared nearer to reality than ever before in the history of the industry and plans are being laid for equipping the forty-passenger, four-engined planes, now being constructed for five air lines, with blind-land-



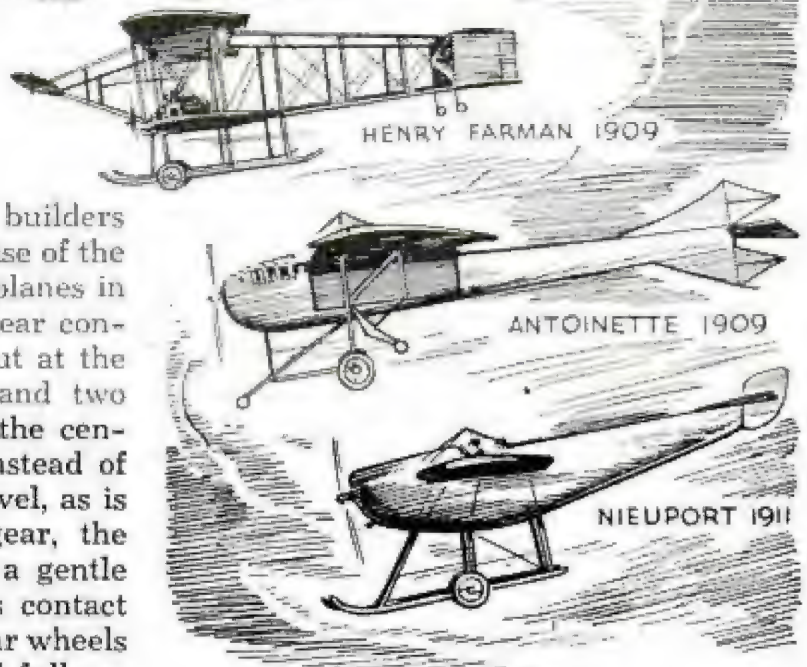
Above, inset, Lorenz visual indicator. Bottom, indicator mounted on instrument panel of plane in which numerous test landings have been made

(Continued to page 156A)

Air Liners Adopt Nose Wheel of Early Planes



Right, some of the early types of landing gear. Top, left, Curtiss plane using tricycle gear. Center, air liner with nose wheel



To increase safety in landing, builders of modern air liners are reviving use of the tricycle gear which appeared on planes in the early days of aviation. The gear consists of a wheel attached to a strut at the forward tip of the ship's nose and two other wheels set slightly behind the center of gravity of the machine. Instead of landing with the ship perfectly level, as is the custom with conventional gear, the pilot simply puts the plane into a gentle dive until the nose wheel makes contact with the ground. Then the two rear wheels touch and brakes may be applied full on. The nose wheel prevents the plane from nosing over or ground-looping, even though rocks, deep puddles and ruts may be in its path. Airplane builders used the tricycle landing gear from 1909 to 1913. The Curtiss pusher bi-plane of 1911 is one of the outstanding examples. As long as the

pusher-type planes remained popular the tricycle gear was retained. Then came the tractor ships, with engine up front, and there was no place for a nose wheel. When twin-motored planes were developed, there was a place for the nose wheel, but the other landing gear, used exclusively

during the last few years, had been employed so long that builders overlooked the old, and safer, tricycle type. After a study of accidents, the U. S. Bureau of Air Commerce recommended, in 1934, that tricycle gear be adopted. Tests with big air liners followed and to-day a giant four-motored transport plane, weighing 60,000 pounds, is being built with nose wheel. This ship has the wheel so arranged that it can be retracted within the fuselage shell during flight, so there will be no additional drag from this source.

Soldiers in Rainproof Overalls Maneuver Anti-Aircraft Gun



Overalls made of waterproof material are adopted by British soldiers during army maneuvers. Here they are practicing anti-aircraft fire

Paddle-Wheel Raft Is Propelled by Hand Cranks

For sports use on lakes and rivers, a novel paddle-wheel raft has been introduced. It is propelled by turning a set of handles which cause the paddle wheels to revolve. The operator sits between two pontoons, on which the wheels are mounted.



Here is the paddle-wheel watercraft. Note that it is propelled by turning the hand-cranks set on each side

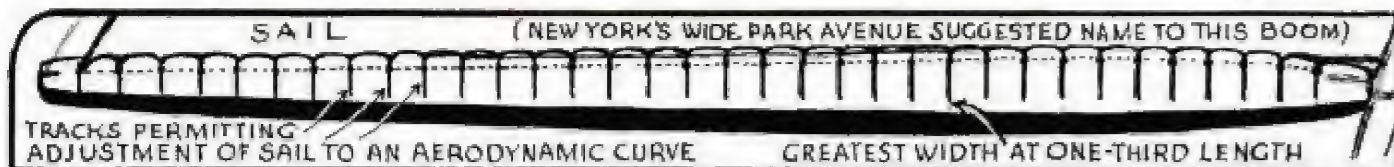
Soldiers dressed in waterproof overalls manned anti-aircraft guns trained on "enemy" planes during recent British army maneuvers at Salisbury Plain, traditional training ground for English fighters. A crew of three men handled each weapon in practice. An unusual feature of their field equipment was a drinking cup dangling from the belt of each man.

Old tire chains are fastened on the steeply inclined ramp of a Tampa, Fla., garage to prevent automobiles from slipping in wet weather.

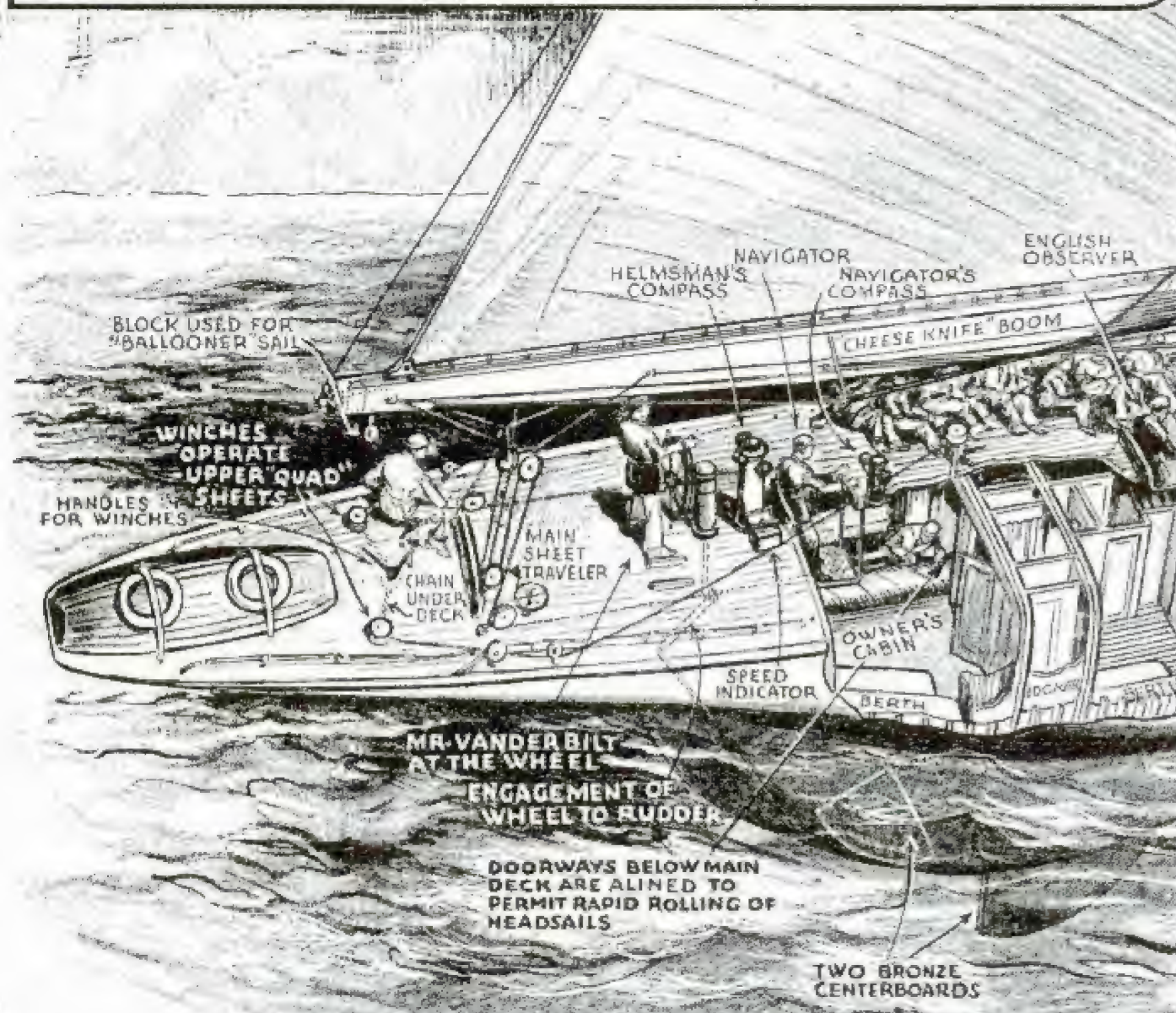
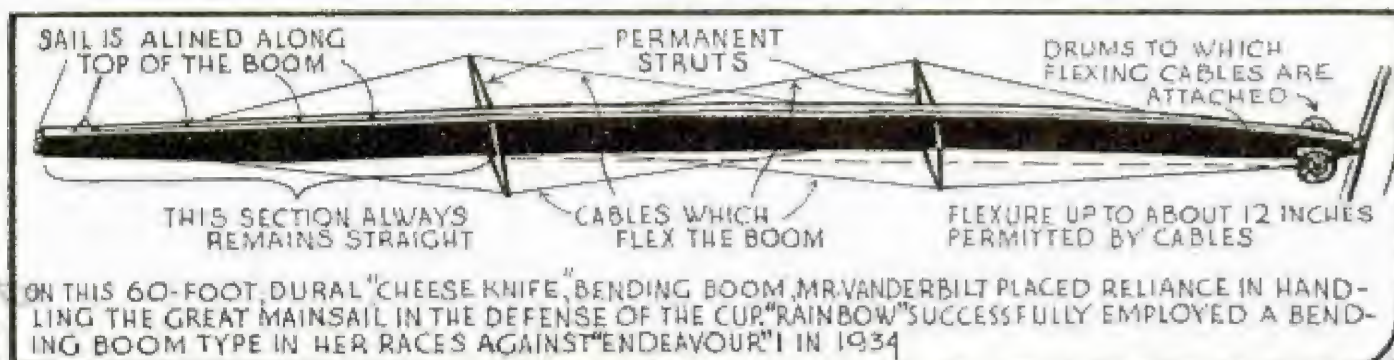
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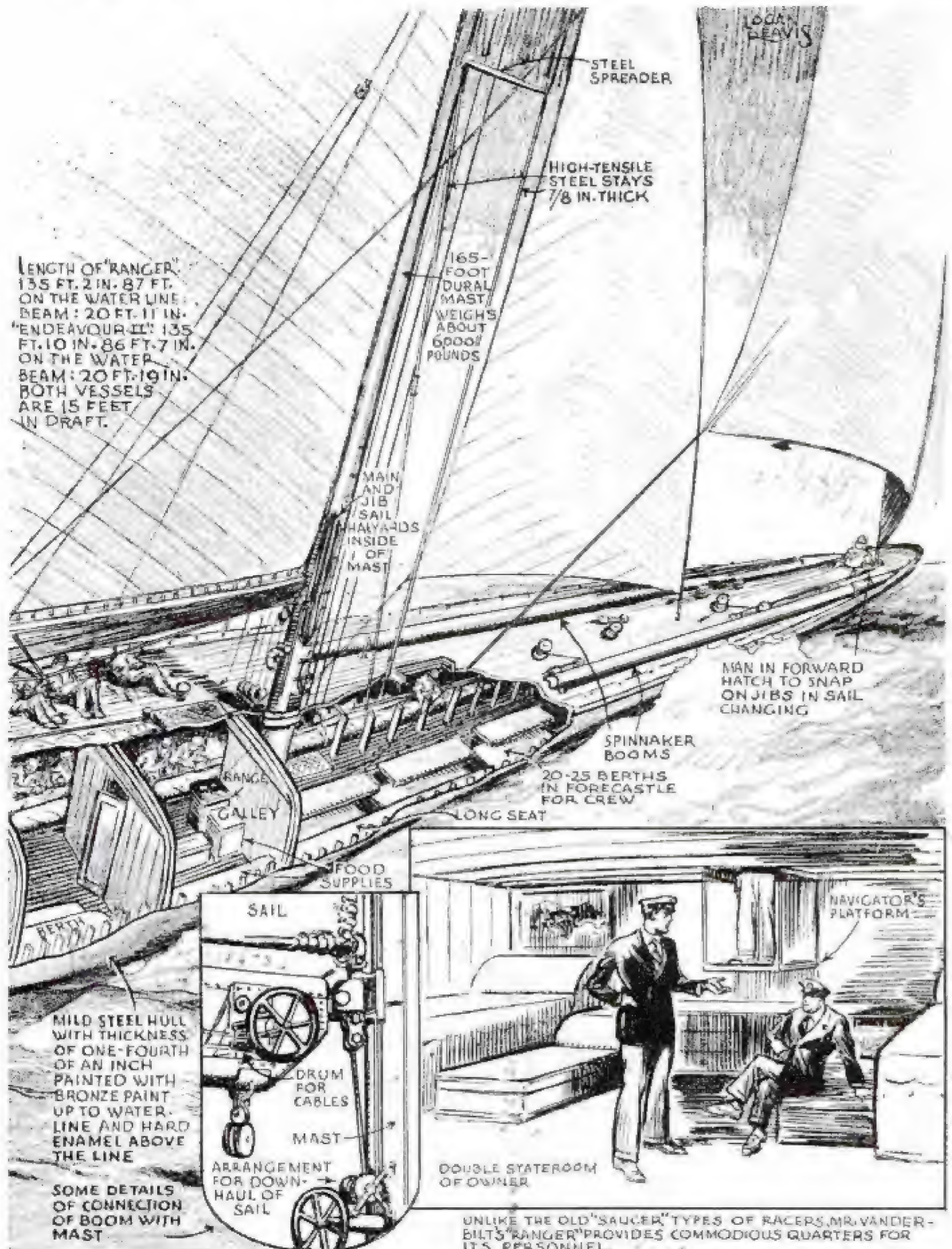
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Three-Ton Dural Mast Carries Giant Sails



Victor over T. O. M. Sopwith's "Endeavour II" of England, "Ranger" has a huge dural mast which carries a vast sail area, including the largest sail ever made, an 18,000 square-foot parachute spinnaker

Single-Motor Plane Sets Record for Distance



Big Russian monoplane in which daring crew flew from Moscow to San Jacinto, Calif., setting a new world's record for non-stop flying. The ship is shown after its landing in California

Driven by only one motor, a big monoplane recently flew from Moscow, Russia, to San Jacinto, Calif., to establish a world's record for long-distance non-stop flying. Estimated mileage of the plane is slightly more than 6,600, although the air-line distance is not that great. At one point the

Russian plane became lost and flew two hours trying to find a way through the fog along the Pacific coast of the United States. The route was by way of the North Pole. Previously the record had been held by two Frenchmen, Rossi and Codas, who flew 5,637 miles from New York to Syria.

Glass-Wall Building Latest on New York's Fifth Avenue



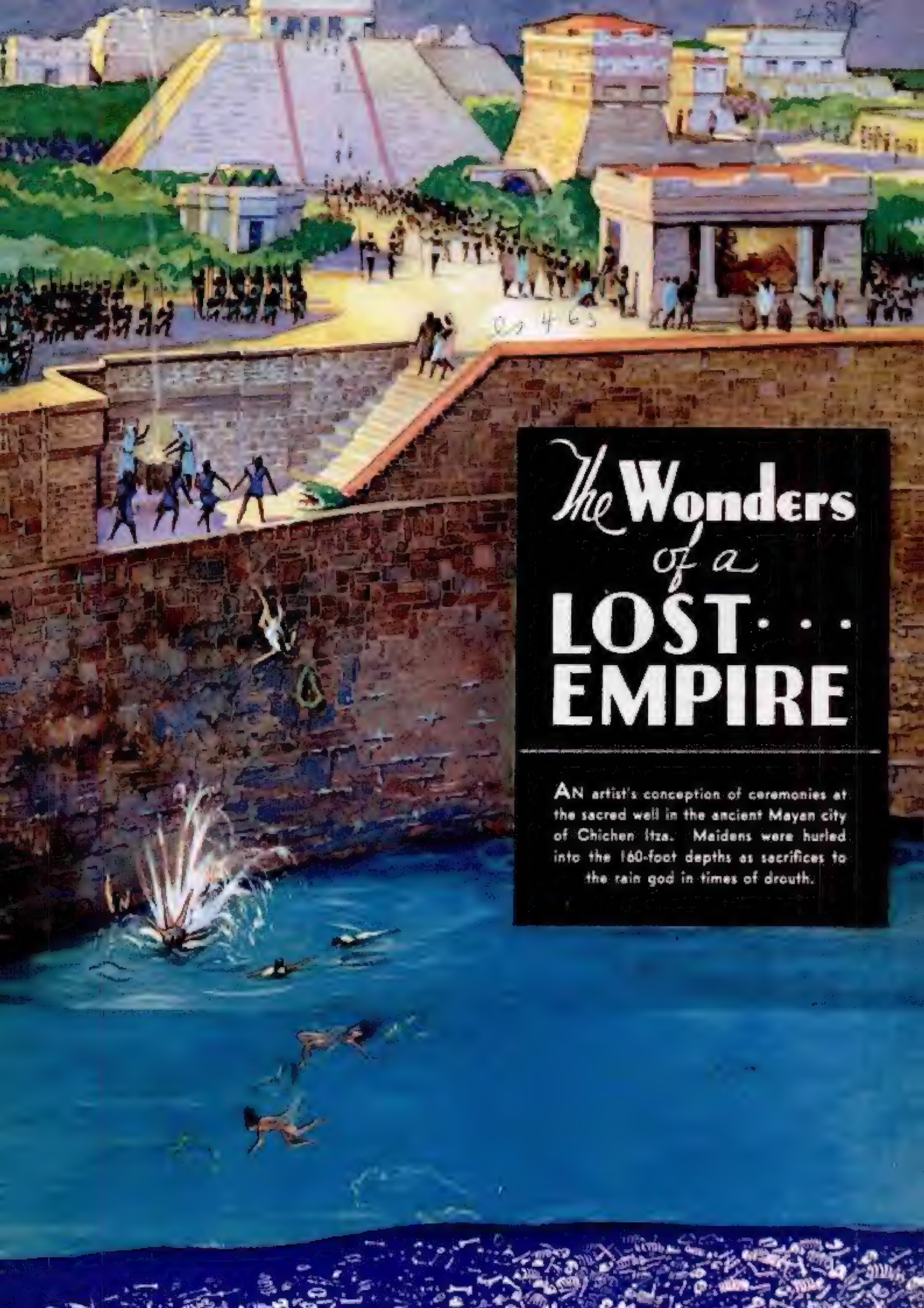
This glass-walled building is among the latest completed on New York's Fifth Avenue

Among the latest structures erected on New York's exclusive Fifth Avenue is a glass-wall building. Trimmed with nickel silver and limestone, the building is topped by a decorative frieze. It will be occupied by the Corning Glass Works.

Geyser to Run Electric Trains by Harnessing Its Steam

By harnessing a giant geyser in the province of Pisa, Italy expects within two years to operate its railways by electricity derived from this "white coal." The geyser has emitted steam for the last year, after being bored deep, and a power house is being built to transform the steam into electricity which will be fed to the railways. Before the steam can be sent into the turbines it must be purged of volcanic gases to prevent corrosion.

Electrification of Larderello.



The Wonders *of a* **LOST... EMPIRE**

AN artist's conception of ceremonies at the sacred well in the ancient Mayan city of Chichen Itza. Maidens were hurled into the 160-foot depths as sacrifices to the rain god in times of drouth.



DRAWING of El Castillo, pyramid temple of the Mayas, as it appeared when discovered almost a century ago.

PART I

IN the jungles of Central America, men of science today are digging down through the debris of centuries and piecing together one of the greatest jigsaw puzzles of the ages—the mystery of the Mayas.

The Maya mystery is the mystery of a lost civilization. One thousand years before Columbus discovered America, these aboriginal Americans had reached a stage of cultural development comparing favorably in some respects with our own. For nearly fifteen centuries this civilization advanced and flourished.

These early Americans built great cities, one of the largest inhabited by a teeming population of 250,000 or 300,000, a city as large as Akron, O., or Houston, Tex. They erected massive pyramids out of huge blocks of stone,

some weighing as much as fifty tons, and atop the pyramids they constructed magnificent temples. They adorned their structures with elaborate carvings and paintings. They employed plaster and mortar in construction work and they cast and molded stucco into ornamental and decorative forms. They built hard-surfaced roads.

And—impossible as it seems—they did it all by hand! They had no beasts of burden. They had no explosives. They had no machinery. They had no metal tools to carve and cut their stone. They had no knowledge, so far as can be ascertained, of the wheel, the pulley or the windlass. Yet they executed architectural masterpieces which would today tax the resources of men skilled in modern engineering and with all the tools, machinery and building materials



20463

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A STREET in the mysterious jungle-land of Yucatan, the "Egypt of Central America." Below, views of turquoise Mosaic plaques, one found embedded in the figure of a jaguar in the temple of El Castillo, the other in a treasure box. Bottom, Chac-Mool, representing one of the minor Mayan deities, as it lay embedded in a huge mass of masonry near the Temple of the Warriors.

Photographs
courtesy
Carnegie
Institution of
Washington



of this modern age at their command.

In addition to their architectural skill, the Mayas were adepts at some of the arts and crafts and possessed considerable knowledge of some of the sciences. They were experts at spinning and weaving and made beautiful cloth out of cotton. They dyed their fabrics in many colors and embroidered them with intricate designs. They employed a form of writing and had a hieroglyphic-recorded history. They possessed a strikingly accurate numerical system, had an advanced knowledge of mathe-





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LEFT, the great ball court at Chichen Itza where was played one of the oldest games in history, probably a combination of volleyball and basketball.

matics and astronomy and used a calendar based on the solar year.

But, despite these and many more attainments as remarkable, the Mayas and their civilization vanished from the earth. Maya culture, the result of centuries of effort, disappeared — disappeared as completely as though it had never been. The jungle swallowed the great stone temples and pyramids and kept the secrets of the Mayas for 300 years. About the middle of the last century, explorers found some of the remnants of their handiwork, but no concerted efforts were made for many years thereafter to retrieve the ruins.

Today, however, the wonders of this lost civilization are being unearthed and slowly restored. For more than twenty years the work has been proceeding

under the direction of the Carnegie Institution of Washington and other co-operating agencies. As a result of these efforts, some of the mystery surrounding these ancient people has been dispelled, some of their secrets have been solved by the story pieced together from the ruins of their temples—magnificent buildings which have defied time. But each new ruin adds new puzzles and increases the admiration and respect of archaeologists for these ancient people, now acclaimed as perhaps the most brilliant aboriginal Americans who ever lived.

Whence came the Mayas? Long before the beginning of the Christian era, a people, perhaps many people, although they may have spoken a common language, occupied the base of the Yucatan peninsula in what now is Guatemala.



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DESIGN, above, from an ancient Mayan cylindrical vase. Right, close-up of the big "doughnut" goal used in the ancient ball game played on the court seen on the opposite page. A giant ball probably was knocked with the hands through this enormous goal.





494
ARTICLES taken from a treasure box dug from the inner stairway of El Castillo, including pieces of jade on which human faces were carved.

Agriculture was their chief occupation and Indian corn was their staff of life. Their principal city was Uaxactun and from it colonies were sent out to the surrounding territory. Soon other cities were springing up. Such was the beginning of the Old Empire of the Mayas.

As the centuries passed, these people, believed to have come originally from the highlands of Mexico and Central America, developed culturally. They devised a system of measuring time fully as accurate as our own Gregorian calendar. They developed a method of hieroglyphic writing to record their history. They studied the stars and possessed a remarkable knowledge of astronomy and their astronomer priests employed a system of mathematics involving knowledge and use of a symbol for zero, perhaps the greatest abstract conception in the science of numbers. Thus the Mayas advanced to cultural brilliance.

They acquired a knowledge of ceramic art and as they accumulated experience in many other fields of human activity, they began fashioning sculpture and stone monuments to record the passing

of time. Then they started erecting buildings of stone blocks and soon were constructing entire cities of stone and filling great plazas with sculptured stone monuments surrounded by lofty pyramids, temples and palaces.

For five centuries or more the cultural development of the Old Empire continued. Then a strange thing happened. At the height of this early period of creative activity a great crisis occurred in the affairs of the Mayas and between the years 530 and 629 A.D., these enterprising people abandoned everything they had created. They left their homes, their fields, their palaces, their temples, their cities and moved northward to establish a New Empire. The Old Empire vanished as the jungle crept over the buildings.

What happened to cause this exodus? No one knows exactly but there are several theories. One of the most plausible is that the Mayas were afflicted with the high cost of living and solved their problem by walking away and leaving every-





TEMPLE of the Warriors, perhaps the most beautiful example of Mayan architecture. Right, flint knife blades and turquoise mosaic plaque.

thing. There is reason to believe that erosion of the soil caused a scarcity of arable land while silting of the lakes diminished the water supply, ruined water transportation and perhaps contributed to an outbreak of malaria or some other form of pestilence.

The Mayas were a superstitious people and continued hard times may have caused the priests to decide that their gods were frowning on them. At any rate, economic causes, particularly the failure of the agricultural system to support the ever increasing population, probably was a contributing factor leading to the abandonment of the Old Empire.

But the Mayas were far from licked. They migrated to the northern part of the Yucatan peninsula and here this brilliant people's civilization burst into full bloom. This section has no rivers, no streams and no springs—but an abundance of fresh water. A few inches below the ground is a limestone crust which is pock-marked at frequent intervals by breaks or





FOURTEEN-INCH ceremonial bowl from Mayan grave. The figure is that of a man poised as though dancing. Left, stone almanac erected about 410 A.D.

"sinks" containing plenty of water. Cities of the New Empire were established near these sinks, three of the most important being Chichen Itza, Uxmal and Mayapan which formed a triple alliance lasting for nearly 200 years.

For almost ten centuries Maya culture flowered in this New Empire, finding its most fruitful expression in architecture, the designing and constructing of great buildings for religious and ceremonial purposes. Here they built huge pyramids on artificial terraces and atop the pyramids they constructed great temples of carved stone. They made and dyed

(Continued to page 128-A)



Life Belt Is Hidden in Headrest of Air Liner

Slinging the life belt over shoulders and around waist and jumping into the sea is a matter of ten seconds. These life belts, packed away in headrests of passenger seats as shown below, are being installed in Imperial Airways flying boats

(c) London News Agency



Inside the linen covers of headrests in the flying boats of Imperial Airways, the English air line is installing life belts that can be detached and slung around the shoulders of a passenger in ten seconds. Ordinarily the equipment is hidden away, forming a comfortable upholstered headrest on a high-back armchair in the cabin. In an emergency the upholstery is detached and harnessed. The life belt weighs only five pounds. Made of light rubber, it can support 280 pounds in the water indefinitely.

Road Thicket to Prevent Headlight Glare Is Planned for Fast Traffic

Proposed as a means of preventing glare, a thicket will be planted between two roadways, each of which will carry one-way traffic, on an experimental stretch of highway in Illinois. The thicket will shield the eyes of drivers from the bright lights of cars traveling in the opposite direction, eliminating the necessity

for slowing up. Stout shrubbery that will absorb impact and keep an automobile from going off the road will be used as a substitute for the conventional guard rails. These two projects are part of a program of novel roadside planting designed by the Illinois highway department to speed up traffic and to increase safety.

Chicago Tribune 7/26/37

Alfred Isreiser, Landscape

Island Roadways to Speed Exposition Traffic

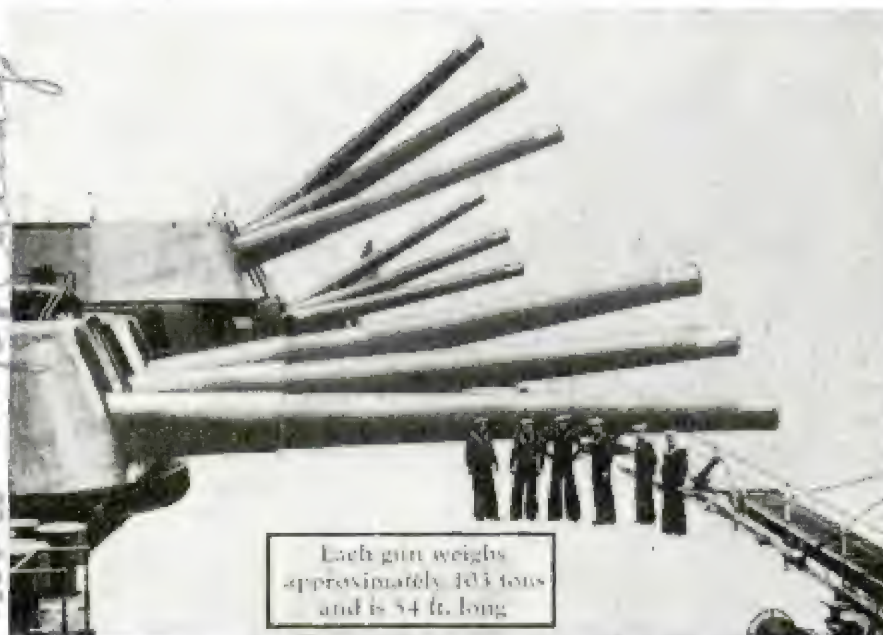


Here is how the 1939 exposition in San Francisco Bay is expected to look from the air. This artist's drawing shows roadway system which is planned to prevent traffic jams near the island site

Vehicular traffic will move fast in the vicinity of the Golden Gate Exposition in 1939 if plans for a network of roads work out. The roadways will branch off from the end of the San Francisco-Oakland bay

bridge and will carry autos, trucks and buses to and from the exposition located on the man-made island in San Francisco bay. Overpasses and underpasses will help to prevent traffic tangles and accidents.

Nine Giant Guns of Battleship Hurl Shells Twenty Miles



These guns on the British battleship "Nelson" are the type planned for the U. S. navy dreadnaughts "Washington" and "North Carolina"

Nine powerful guns that can fire, in one vast salvo, projectiles weighing more than a ton each at an enemy twenty miles distant will be mounted on the battleships "Washington" and "North Carolina," planned by the U. S. navy. Each of these sixteen-inch guns will weigh about 103 tons and will be fifty-four feet long. The navy experts are faced with a delicate engineering task to mount these cannon, three in a turret, so as to provide maximum firing power and accuracy without decreasing the

ship's speed or affecting its efficiency. Hydraulic mountings with springs in tanks of oil will absorb the terrific kick of the weapons. They are to be loaded electrically and fired automatically, attended by trained gun crews of ninety to 100 men. The ton projectile will leave the muzzle at 3,000 feet per second and travel to its mark, twenty miles away, in one minute. These guns will rank with the most powerful in the world.

Puppets Made to Resemble History's Famed Figures



Here is the designer with his big collection of puppets, many of which resemble famed characters. You can recognize some of them.

Plate-Glass Fence Surrounds Home in San Diego

Around his palatial home, a San Diego resident has built a high plate-glass fence, explaining to his friends that he had "always wanted a fence I could see through." The lower part of the fence and the posts and frames are of concrete.



Concrete fence with large plate-glass windows in upper part, surrounding a large residence in San Diego, Calif.

Puppets resembling heroes and villains of history and fable are among the collection in the studios of the Chicago Parks District. Anton Rogalski, designer of many of the dolls, says that constant association with them gives one the impression that they are almost human. In the collection

are puppets resembling Shakespeare, Macbeth, the Duke of Windsor, Chopin, the composer, Frederic March, Greta Garbo, Humpty Dumpty, Alice in Wonderland, swashbuckling buccaneers, Spanish dancers and many others.

☛Pumice is being used in Italy to make building blocks that are light, unaffected by moisture, can be sawed or nailed, and are more resistant to heat and sound than concrete.

Com. Eddie Sereva
Box 366, Encanto

Compressed Air
Magazine, June 1939

Com. Henry C. Schaefer
2203 S. W. Walton, Chicago

Is it 8-2-3 Eastman Kodak Co. Rochester, N.Y.

PICTURES *in*



YOU need not be an expert photographer to become a specialist.

A chemist in Ohio specializes in bird pictures. He may wait for hours to catch a mother bird returning to her nest with a tasty insect for the gaping mouths of her featherless youngsters. A stenographer out west specializes in pictures of children and has won many prizes with her unposed studies of babies and youngsters. One of New York's socialites is noted for his "candid" shots of people, caught off-guard by his impertinent lens. Others in camera fandom make marine views their specialty, or railroads, or skyscrapers, machinery, sports.



You need not travel far for a water scene. A park lagoon in the middle of the city inspired the top picture. Rocks and foliage in the foreground helped "frame" it. Notice how reflections have doubled the beauty of Japanese scene below

NATURE'S LOOKING GLASS

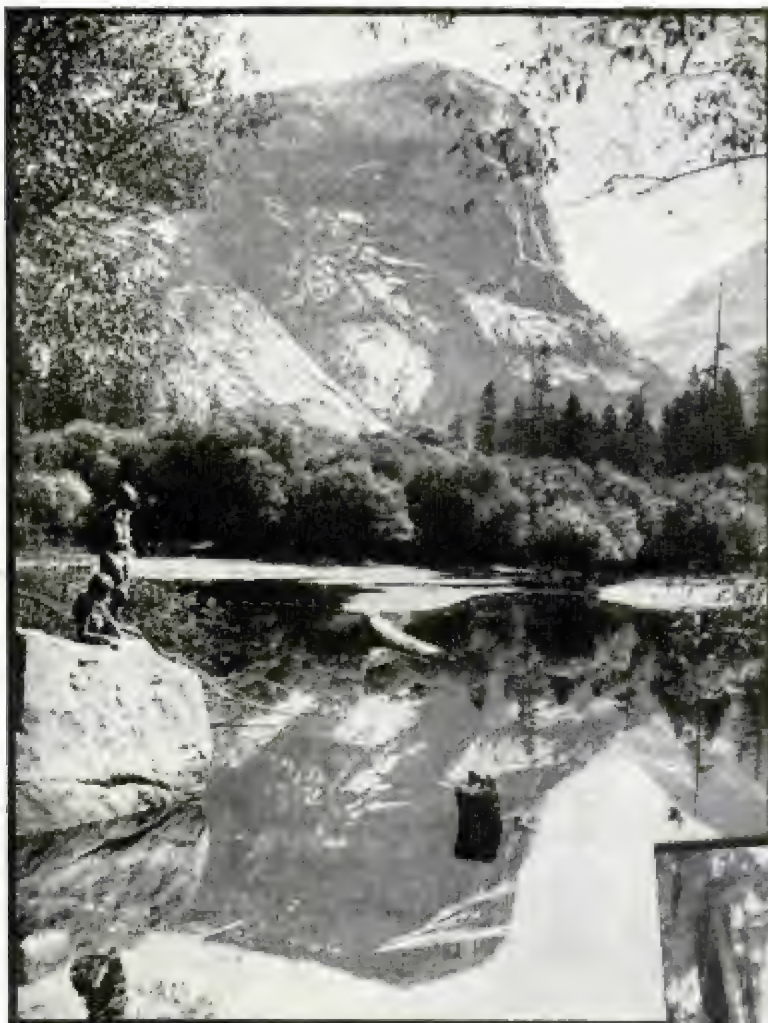
Why not make "wet" pictures your special hobby? Marine pictures—waves pounding a rocky shore, placid lakes set in a green wilderness, fishing smacks idling in port, the white water of mountain streams—these have been favorite subjects of painters always.

Glance into nature's looking glass and you are almost sure to find fascinating reflections to photograph. Sometimes quite ordinary landscapes gain startling beauty as they "double" themselves in a mirror lake. A park lagoon right in the middle of your home city may hold the mirror for a lovely scene if you watch its moods for the right moment, the right combination of shoreline, foliage, cloud and shadow.

Of course you cannot expect to see strong, well-defined reflections at every hour of the day. That's too much to ask of nature, for the depth and sharpness of shadows and reflections are governed by the light and the position of the sun. Two or three hours before noon or the latter part of the afternoon, when the sun is fairly



Here is a snow-clad mountain peak with dark pine trees furnishing a contrast, a perfect subject for a photographic look into nature's mirror. Nearly every day there is a "quiet hour" when these mountain lakes are smooth as glass



low in the sky, is usually the best time for shadow and reflection pictures. If you have a certain view in mind, study it at various hours, choose the time for the best pictorial effect and then go back the next day to snap the picture.

If you have spent a vacation in the Rocky mountains you probably have learned the habits of certain lakes. At the breakfast hour they will be perfect mirrors, unruffled by the slightest breeze, doubling the beauty of the surrounding mountains and pines. Before noon the wind begins to ripple the surface, and your reflections are washed away until, perhaps, there comes a lull at sunset when you can catch the scene again, now mirroring red clouds and purple mountains. This is a picture calling for color photography.

How to expose your film is a question depending on what you want to emphasize. If you expose for the principal subject and not the somewhat darker reflection in the water, you would make a more rapid exposure by increasing your shutter speed or you would reduce the amount of light

by using a smaller lens aperture than you would if you intended to feature the reflections. Wet scenes, however, are often deceptive. Water reflects light, even emphasizes it, and you may discover that you have over-exposed a film against the brilliance of a sunlit lake. Experience is your best teacher.

In the looking-glass pictures that illustrate this article, the exposures were obviously planned to bring out the reflections. Notice the depth or "third dimension" effect obtained by including the water and reflections in the foreground. Cover the lower half of the pictures with your hand and observe the change in appeal. What remains is just another snapshot.



Top, grandeur of Yosemite is mirrored in lake below. Ripples in the dark water of a South Carolina cypress swamp form lovely pattern in bottom picture

Swift running water holds endless fascination. You will sit hours at a time charmed by a waterfall, rapids, or whitecaps on a lake. And yet you can point your camera at a deep blue lake, whipped into foaming waves by a stiff breeze, and get a worthless picture. You pointed it offshore to a featureless rectangle of water and sky. What that picture needed was a flash of white sail in the middle distance, white clouds piling up for contrast in the blue sky. Or perhaps you could have made a picture worth showing by pointing along the shore, tak-



Child caught unawares at lily pool and ship on sunlit waves are contrasting types of water scenes, each charming in its own way

ing in the curve of a beach with the breakers rolling in, a high dune etched with waving reeds, or the remnants of a beach fire in the foreground to catch the eye and tell a story.

Fishing villages offer a multitude of opportunities for picturesque snapshots—the kind that “make” the travel magazines and rotogravure sections. Sailing boats and

tugs bringing in the catch, fishermen mending their nets, ships tied up at their docks with little ripples playing in the dark reflections beneath. Gulls swooping low and bobbing on the water challenge you to try for an action shot.

Stop down your lens aperture some afternoon and turn your camera toward the west to catch the glint of sunlight on the waves. If you are careful not to

over-expose, you will have a “seascape” worth framing.

You may live far from the coast, far even from any great inland lake. Still, you need not travel very far to find wet pictures worth having. If you only know it, your camera can have as much fun along the creek that crooks through the cow pasture as it can around Cape Cod.

Reindeer Sent by Airplane for Use in Motion Picture



Reindeer trussed and ready for airplane trip. A hurry call from a movie director brought the animals to the "location" scene

When a director needed twelve reindeer for a motion picture being filmed in Alaska recently, they were transported by airplane from a point 500 miles away. The animals, carried six at a time, were trussed securely, but one escaped his bonds and only quick work by the pilot's assistant saved the plane from damage. Also on the plane were twelve sacks of reindeer moss.

Carbon Dioxide Freed in Air Holds No Peril for Man

Although 180 billion tons of carbon dioxide gas have been released into the atmosphere by the burning of mined fuel during the last fifty years, there is no danger that the content of the air will be contaminated enough to endanger man. The carbon dioxide has been, and is being, returned to the earth through the decay or combustion of plant life. In addition, well over ninety per cent of any excess carbon dioxide introduced into the atmosphere eventually finds its way into the ocean, being readily dissolved. Dr. Robert E. Wilson allays the fear of many people that the gas content might become perilous by pointing out that even if none of the carbon dioxide released in the air had been removed, its average content in the atmos-

phere would have increased only two-thousandths of one per cent, from a normal of 0.03 to 0.032 per cent. There is no fear, the scientist asserts, that chemistry and industry are working an atmospheric transformation that might threaten human existence.

Speedy Little Motor 'Bike' Built in Home Workshop

You may call it a "baby motorcycle," but it can travel thirty miles an hour and carry anyone from a seven-year-old to a 210-pound policeman. Driven by a one-cylinder, two-cycle engine, this tiny edition of a real motorcycle was built in the home workshop of an Oak Park, Ill., resident, at a cost of less than fifty dollars including original dies. With only a word of instruction, neighborhood children only seven years old have ridden it. The "clutch" is a hand lever which moves the motor and applies or releases tension on the driving belt. Although the motorcycle is equipped with a magneto, the builder said he would substitute dry batteries if he built another. It travels 150 miles on a gallon of gas.

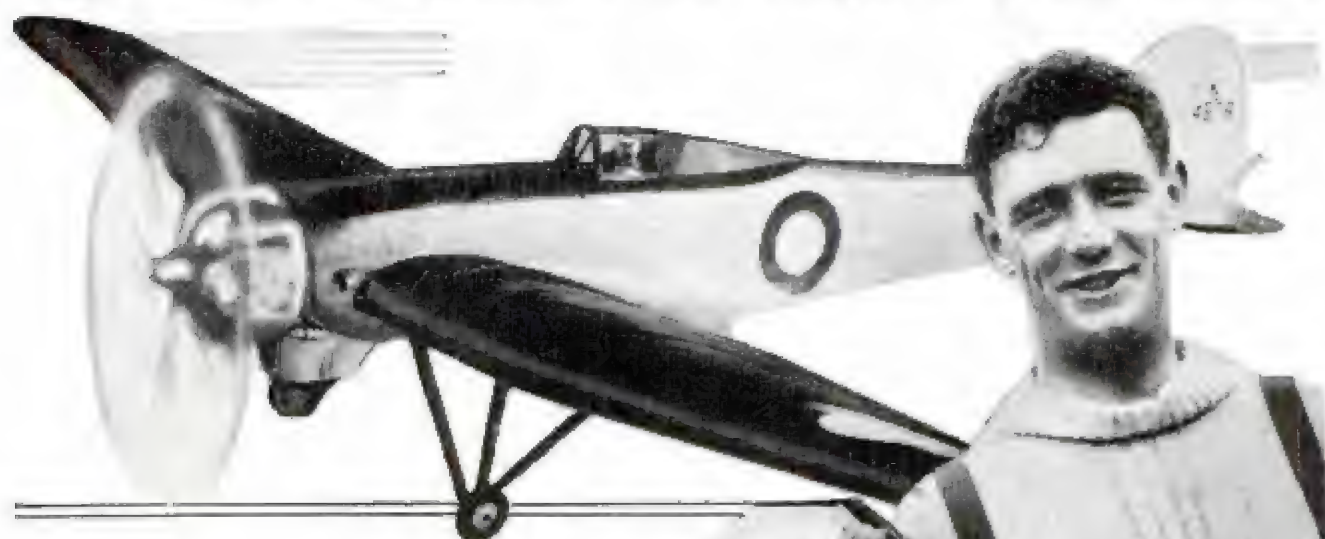


Comfortable for children or grownups, this home-built "baby" motorcycle is driven like a big one.

Home made R. B.
Built by 741

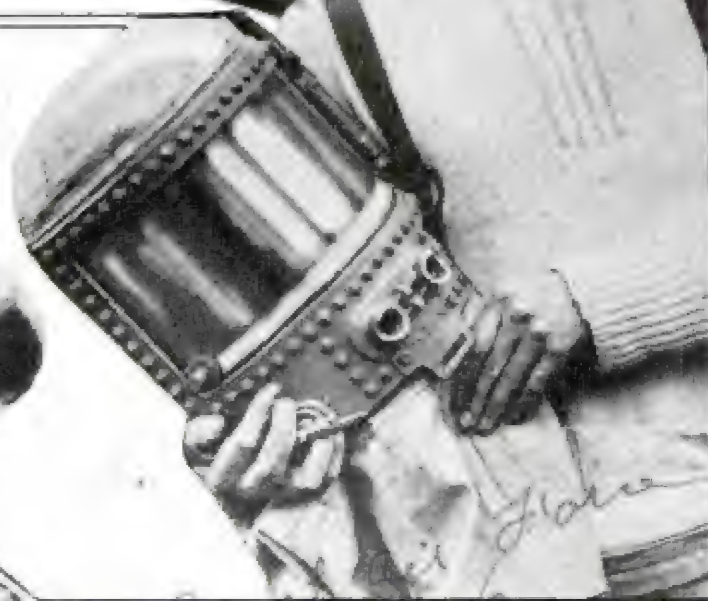
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My Co.
Hamphrey Ave. Oak Park, Ill.

Upper Air Explored for High-Flying Liners



Explorers of the high altitudes are helping to bring nearer the day when air liners may speed through the sub-stratosphere, or perhaps the stratosphere, five to ten miles up. Above, monoplane in which British pilot recently climbed to 53,939 feet, a new record

Bristol



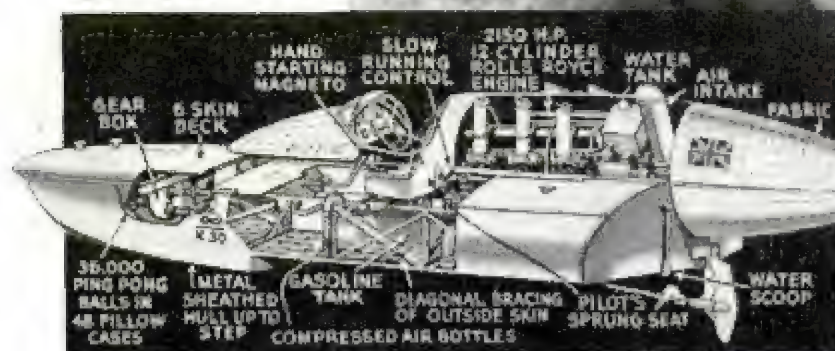
Acme



Above, Flight Lieut. M. J. Adam of England, who established new record. Left, the lieutenant, clad in special suit and helmet, climbing into plane. Below, Lockheed Electra plane has air-tight pressure-sealed cabin. Passengers and engines are supplied oxygen by turbine superchargers. In tests, flying at 28,000 feet was found as comfortable as at 12,000. A temperature of seventy-eight degrees was maintained in the cabin into which the superchargers forced air heated by the engines. Outside the temperature was ten below zero. Speeds up to 400 miles per hour in high altitudes are predicted



Marine "Bluebird" to Try for World's Record



Top, sketch of "Bluebird," as it will appear in the water. Bottom, drawing to show essential details of the marine speedster

Constructed under the direction of Sir Malcolm Campbell, who drove his big "Bluebird" racing automobile faster than any land vehicle has ever moved, a marine "Bluebird" is ready for speed trials. Powered by a 2,150-horsepower twelve-cylinder Rolls-Royce engine of the type used to drive airplanes, the speedboat will be employed in attempts to establish new records for speed on water. An unusual feature is the placing of 36,000 ping-pong balls in pillowcases inside the front end of the hull, which is metal sheathed up to the step. An air intake for the big power plant projects slightly above the top of the en-

gine compartment cover. A water scoop at the rear of the hull picks up water to replenish the tank from which the engine draws its cooling water.

Real Edge Is Put on Sandpaper by Electric-Belt Treatment

Sandpaper is no longer a mere sheet of paper with grains of sand scattered hit or miss on its glued surface. An electric-belt treatment now makes the abrasive grains stand with their sharp points upward to form a cutting surface of maximum efficiency. An electric field of forty to fifty

From American Chemical Society

thousand volts is produced between a dry belt carrying the sand and the glue-coated sheet held three-quarters of an inch above the grains. The sand is picked up by the lines of force of the field in the direction of the major axes of the particles so that the sharp edges of the grains uniformly stick up, uniformly distributed. Flint, garnet and emery are the abrasives used naturally, while silicon carbide and fused aluminum oxide are the synthetic abrasives. All must be ground to assure sharp fracture edges. Coated abrasives are now manufactured by the acre in a single plant and are used in such widely different industries as furniture and felt-hat making, shoes, automobiles and airplanes, marble, jewelry, and golf-club manufacture.

"Hanging" Roof of Concrete Is Supported by a Single Wall



Overhanging roof of concrete reinforced with iron ribs rests its entire weight on the one wall of which it is part, anchored to foundations

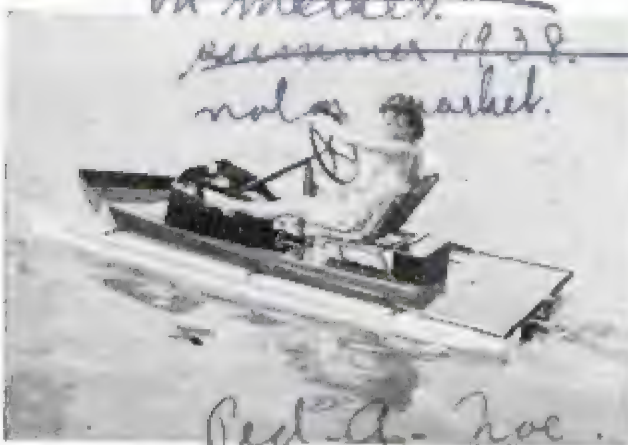
Anchored to the foundations, a "self-supporting" roof of reinforced concrete designed by a German architect rests on a single wall. Roof and wall, in fact, are a unit. The "hanging" roof is reinforced with iron ribs, and the entire structure is supported by two foundations under the house. The engineers figured that the roof would sag about six inches in front, and that as the foundation yielded a little there would be a further sag of about four inches in the roof. When the roof was completed that is exactly what happened.

Spark Plug Gap-Setter and Gauge Has Magnifying Glass

Spark plugs may be checked, adjusted and set accurately with a combination gap-setter and gauge which has a magnifying glass for showing motorists the true condition of the plugs. The instrument is made of lightweight metal. The outer rim contains six different gap measuring prongs.



Bicycle Boat Easy to Propel on Fishing, Camping Trips



This boat is propelled like a bicycle, by operating pedals to turn a big propeller

Equipped with a sixteen-inch propeller, a bicycle boat recently was tested at speeds up to ten miles per hour. It is easy to propel. The boat will be placed on the market to be used on fishing and camping trips. There is sufficient room on the deck to accommodate an extra passenger.

A. Wirth 4102

Electric Auto-Lite
Co. Toledo, Ohio
Faulenbach, Düsseldorf
Verwaltung Verband
es 847
es 828
es 846

DIVING



vaging tests, the world's deep-water diving record was 307 feet, made by Frank Crilley in attempting to contact the sunken submarine "F 4" off Honolulu.

Our problem was not merely to go five feet deeper than Crilley, we were faced with the fact that 120 to 200 feet is ordinarily considered the limit of the standard diving dress for anything but stunt diving. An entirely new set of problems was presented. A new type diving gear would be necessary to meet them.

A deep-sea diver requires an artificial air. Without the proper ingredients and mixtures, he could not live very long while prowling around the depths or ascending and descending. Ordinary compressed air has its drawbacks. After countless experiments, we finally hit upon a mixture, which offers several advantages. We discovered a heli-

By Max Gene Nohl

Famous Deep-Sea Diver

(As told to F. MacDonald Bryan)

PERFECTED for use of Capt. John D. Craig and his crew on the "Lusitania" salvage-photographic expedition and for other work, the Craig-Nohl diving dress makes diving "go modern."

The "Lusitania" lies on her side in 312 feet of water. Prior to the "Lusitania" sal-



Top, Capt. Craig shooting underseas with camera. Bottom, Diver Nohl on bottom of swimming pool

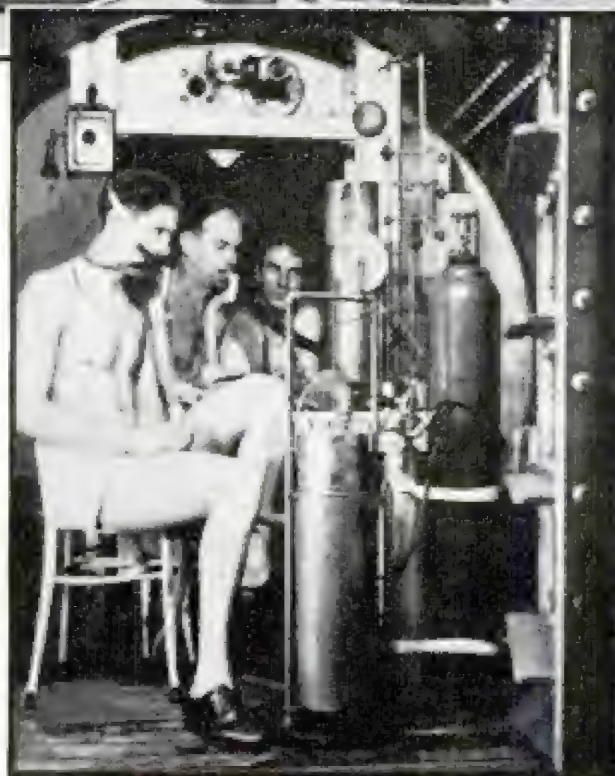
GOES MODERN



um-oxygen mix, which proved superior to the long-used oxygen-nitrogen mix.

Helium is the lightest gas known to man, with the exception of the highly inflammable hydrogen. This property affords desirable physiological characteristics. Using nitrogen and oxygen, that is, compressed air, the time required to enable a diver to reach the surface from the "Lusitania" would be approximately seven hours, after only one hour's work on the bottom. With the new helium-oxygen mixture, this decompression time can be reduced to thirty-four minutes for the same working time with the same degree of safety.

One of the greatest limitations to deep-water diving is a phenomenon known as oxygen poisoning, resulting from the high oxygen molecule content of compressed air in deep water. The Craig-Nohl self-contained apparatus overcomes this for the



*Top, filling diving tanks with helium-oxygen mixture.
Bottom, test in recompression chamber*



first time by providing a low oxygen content air for working under high pressure.

In the Craig-Nohl diving dress, the diver is completely self-contained. An air supply sufficient for fifteen hours is carried on his back in steel air bottles. The greatest danger to present-day diving, the air hose or life line to the surface, is eliminated, allowing work in tangled wreckage and penetration into a hull. The diver need have no fear of fouling lines. Neither can he be pulled off the bottom by a strong current. He will be able to penetrate the most remote corner of the interior of any liner, knowing full well his life can not be snuffed out by a bent or broken life line.

The helmet is constructed of a special steel alloy, heavily chromium plated, and cast in two pieces to receive the cylindrical glass window. This window is heavily guarded on the outside to prevent any possibility of breakage. The diver has 360-degree or all-around vision. Distortion is greatly reduced. The dress is made of rub-

berized canvas, actually thirty pounds of latex going into each one. The outer and inner surfaces are rubber, so they cannot "wet" as does ordinary standard commercial diving dress, making drying unnecessary. The diver has a choice of cuffs, mitts or gloves. These may be interchanged in a few seconds. The underdress slips on like a flying suit. It has built-in feet, zips up the front, and is made of heavy pure wool with a waterproof covering, so as to shed leakage water.

The fundamental consideration throughout has been to make everything foolproof, a consideration of vital importance to



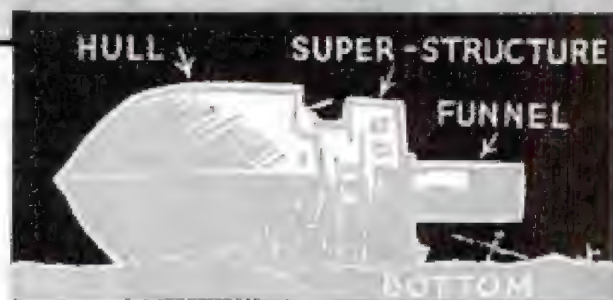
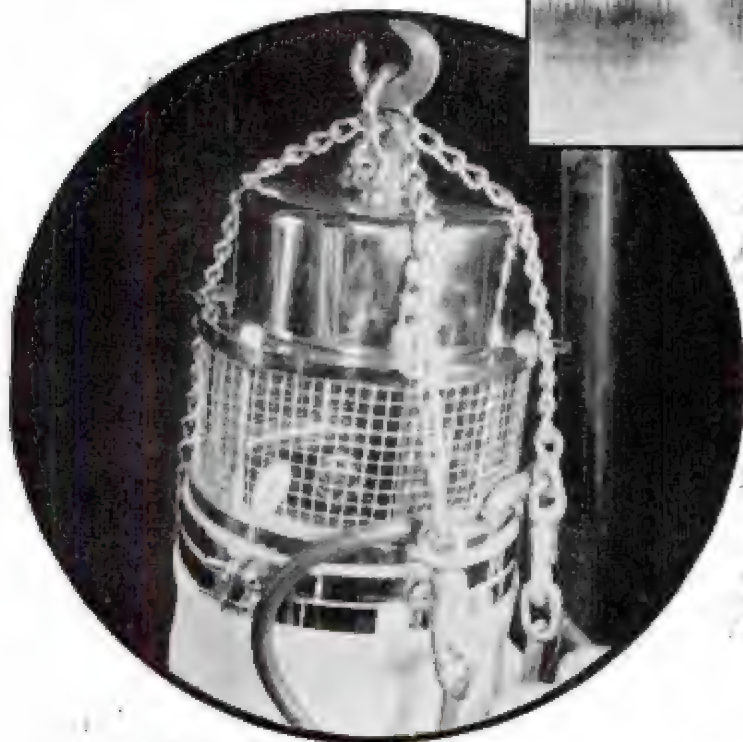
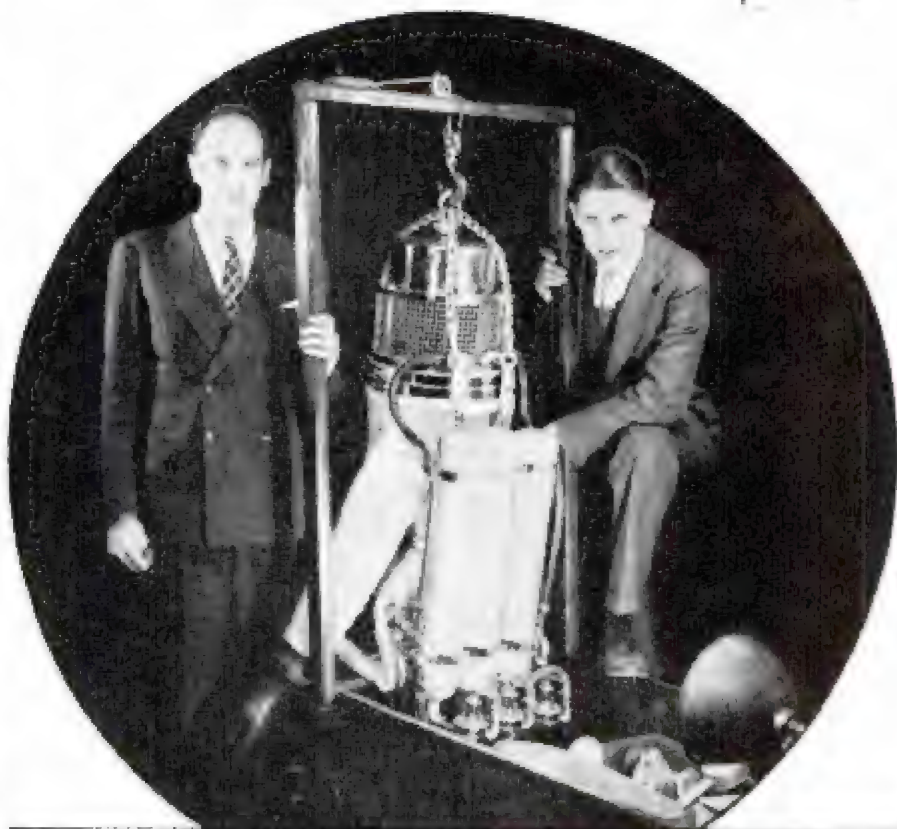
Top, diving dress ready for packing in container. Bottom, Capt. Craig and Nohl in standard gear. Note Capt. Craig's earphones

practical diving. There is no piece of equipment for which there is not a duplicate or substitute, so regardless of what happens, the diver will likely never be subject to danger from mechanical failures.

The typical professional diver of today is a "weight lifter" type. Climbing up and down a ladder with 200 pounds of diving equipment is no easy job. However, in the new suit, no weight is placed on the diver's shoulders, at any time. He merely settles down in the dress, and is whisked in and out of the water without the slightest effort, saving this energy for the work below. The long dressing time, ordinarily requir-

ing a full hour, can be reduced to sixty seconds. There is only one quick operation for the tender to perform, an operation as simple as closing the snap on a trunk.

There are many little things for the convenience of the man under water. Built-in pockets carry knives conveniently sheathed, a vital part of any deep-sea diver's equipment. I have several times found it necessary to cut myself loose from tangled wreckage, even in shallow depths. Like a modern plane or automobile, the suit is equipped with a dashboard so that the diver may obtain through instruments the maximum amount of information about conditions under which he is working. A compass establishes a sense of direction on the ocean floor. A clock indicates the time,



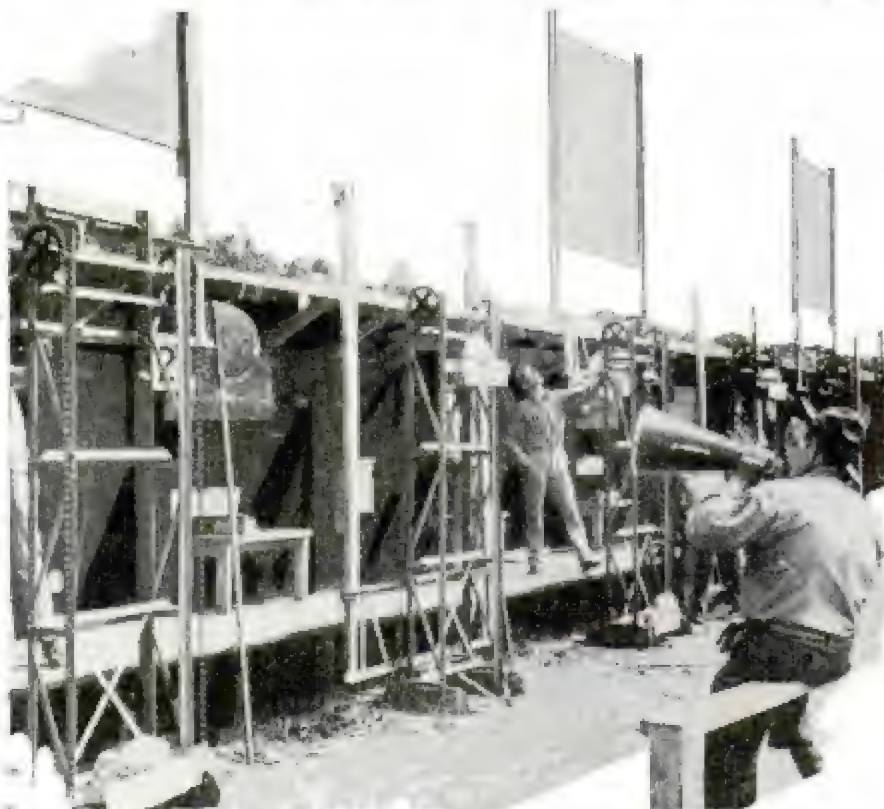
so he may plan his work or properly decompress himself, should necessity demand. Another gauge advises him as to the exact depth at which he is working or decompressing. Still another instrument shows the amount of air entering his helmet. All of these are equipped with luminous dials so they may be read in darkness.

Because of the long diving periods necessary on the "Lusitania" the question of

Top, packing diving dress. Center, echo-finder graph of "Lusitania." Bottom, 360-degree vision helmet containing instruments and food tube

(Continued to page 154A)

Grenades Pitched 275 Yards on Marine Practice Range



Line sergeant bossing privates as they record hits on the U. S. Marine rifle and grenade practice range at Cape May, N. J.

Marines are taught accuracy in handling rifles and grenades on the practice range at Cape May, N. J. The latest type of grenade-throws used by the marine corps hurls high explosives with great accuracy for a distance of 275 yards. When the rifle range is in use, a line sergeant directs privates in marking up and recording hits from "below decks" along the line of targets.

Tree Rings Tell Secrets of Age of Early Settlers and Saints

Even the ancient wooden "saints" carved by Indians of the southwest can't conceal their ages. The "tree-ring" calendar is giving them away, just as it aids historians studying the dates of pioneer settlements. The principle of this calendar is that a growing tree adds a yearly ring whose width depends on rainfall and other climatic conditions. The Tennessee Valley Authority has made such a calendar of the south to determine whether its dams are adequate to supply water power in the

worst drought conditions. Standing trees provided a 350-year calendar, and from this historians could tell what year the settlers chopped down trees for their cabins. Now scientists are trying to learn from rings on wooden bases of the old saints statues in the southwest just when the Indians fashioned them.

Clips Hold Plates on Walking Stick as Hiker Eats

When the hiker gets hungry, he may convert his walking stick into a lunch table by using small clips on the stick to hold plates and cup and saucer. Everything necessary for the quick conversion may be carried in the hiker's knapsack except the walking stick.



Here is the hiker having lunch. Note how walking stick holds plates securely

Soundproof Vault Helps to Find Auto Noises

Constructed for the purpose of helping engineers detect and eliminate noise in the automobile, a new acoustical laboratory is in use at General Motors proving ground. Inclosed within the building are two specially built soundproof rooms, each with separate walls, ceiling and floor to shut out outside noises. Sounds initiated in these and other testing rooms are recorded on instruments set up in a central control room, which has forty-eight separate circuits connecting it with various outlets in



Top, measuring auto's noise piped from "silent room." Center, the vaultlike soundproof building. Bottom, moving an automobile into the building for noise tests. Note the double doors which help to keep air within two rooms so still that the silence is almost oppressive



the five testing rooms in the building. An unusual construction has been employed in the "silent rooms," in one of which the air is so still that the silence is oppressive. The floor is built on a six-inch concrete base, which is topped by a layer of heavy felt "chairs" over which is laid a three-inch layer of concrete. On top of that is a layer of rock wool, a two-inch air space, another layer of rock wool and a covering

of transite. Ceilings and walls are separated from the rest of the building by a six-inch air space. One of the silent rooms is built to admit an automobile for body, chassis and engine acoustics tests. The other will be used principally for testing parts. A third insulated room contains an engine dynamometer and apparatus for operating the chassis dynamometer tests. An overhead treadmill has been built into the ceiling of another room to eliminate vibration during chassis dynamometer tests. The car is raised to roof level on a special hoist and run onto the wheels of the treadmill on the roof of the building. A portable recording machine measures the data in the room below.

Names and addresses of manufacturers and dealers in articles described in this magazine will be furnished by our Bureau of Information upon request accompanied by stamped, self-addressed envelope.

GOING *to the* DOGS



We spend more for dogs than for shoes. Our dog crop is almost as important as our wheat or cotton crop; three times as much as our potato crop. Dogs cost us as much as federal government did—just a few years ago—and we spend almost as much for dogs as for higher education. Five years ago \$100 could be counted upon to buy a fairly good dog of any of the 108 accredited breeds. Today prices average fifty per cent higher. There are no less than seventy-five famous show dogs valued in excess of \$10,000. There are now about 30,000 kennels showing or breeding pedigreed animals. About 1,134,000

By Charles Morrow Wilson

DOGS are costing the United States at least three-quarters of a billion dollars a year. According to estimates of the American Kennel Club, governing body of pure-bred dog activities, there are now 15,000,000 dogs under license, tax assessment, or registry. The number seems to be increasing at the rate of at least 2,000,000 a year. There are probably between 5,000,000 and 10,000,000 more dogs not on the records.

Ten cents a day or \$36.50 a year is the low average cost of keeping a dog. Government statisticians believe, therefore, that \$600,000,000 yearly goes to upkeep in addition to at least \$150,000,000 for dog purchase.



Top, after broken leg of boy's pet is set by veterinarian. Bottom, pit bull wearing \$100 leopard-skin jacket which was tailored by exclusive furrier

Langer

Emb. Andrew W. Larich 2120 P St. N.W. Washington D.C.

Charles Morrow Wilson

film produced
John Birch

Runs into MILLIONS



pure-bred canines are listed in the American Kennel Club. Optional value of these dogs might be set at half a billion dollars.

From a standpoint of record sale and cash payment, tops in dog prices is \$9,500—for a chow bought in England by an American woman. The chow was Champion "Choonam Brilliantine," of Manchoovia Kennel.

Just how does a dog go about becoming valuable? He gains value from strain, or blood relationship to famous dogs. In show dogs, every breed has accepted standards as to size, weight, head, ear, and tail carriage, markings and color. Because a dog conforms to these standards, he may have a



Top, "Lightning," a German police dog acting in the movies, was covered by a \$250,000 life-insurance policy during one contract. Bottom, Bedlington terrier, one of dogdom's aristocrats

show future but he still hasn't gotten into the money.

The American Kennel Club, which is an association of about 190 clubs throughout the nation, requires that a dog must work his way up. Each year about 300 open

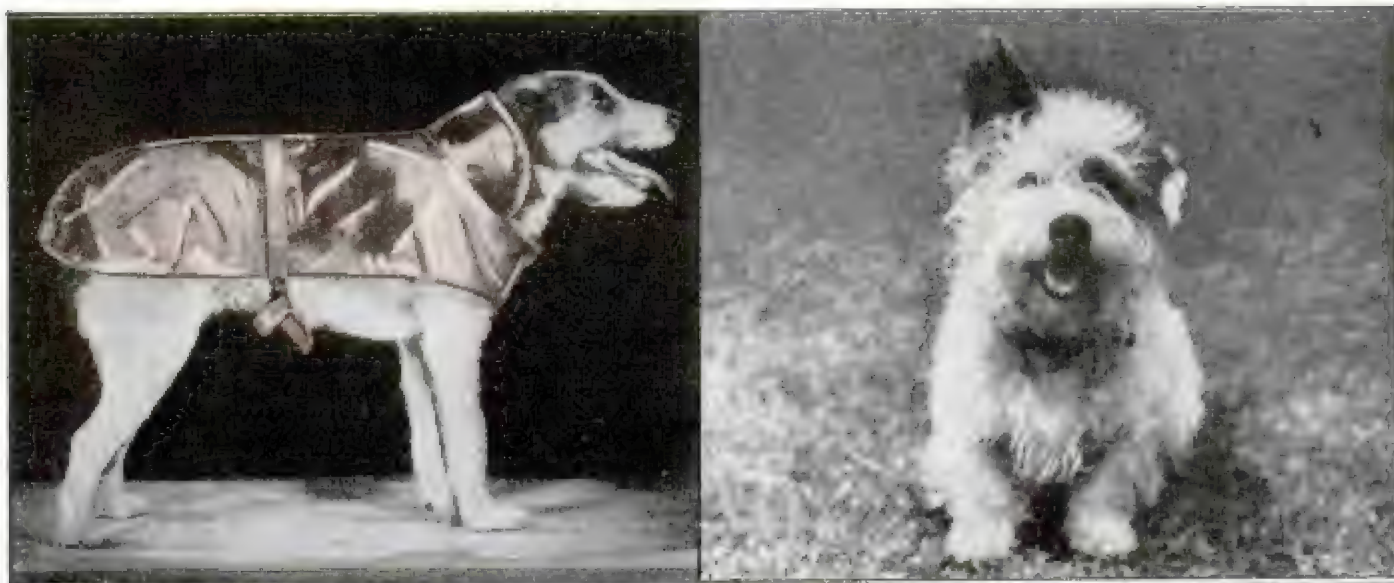


shows are held under rules of the kennel club. These shows establish about 1,000 champions a year. The next step is for the champion to compete in variety groups, where he must stand against various breeds, ages, clans and strains of dogs. Having won a variety group, the dog begins to take on value. If he can repeat he usually scrambles into the money. His owner is besieged with application for stud services, or if the group winner is a female, her puppies, present or future, begin to command high prices. Stud fees of \$500 are not exceptional, \$300 is common and \$100 small change.

Heretofore, we have placed greatest accent upon show dogs. Now the work dog increases in importance and value. Disci-

pline and training standards of the working dog are helping to evaluate the show breeds. Nowadays it pays in dollars and cents to train any dog to behave himself and to heed orders. Very recently, the American Kennel Club established official standards of obedience for all breeds. Originally a show dog was merely a creature to please the eye; a working dog an animal to help man get jobs done. The collie offers one of the best illustrations of a great breed which has been "worked over" to meet both needs.

Here in the United States we think of the collie in terms of the show collie, the handsome long-nosed white and gold or white and red-brown. But in Scotland, dog fanciers talk more in terms of work-



Top, left, modern styles in lap dogs. These cost \$1,500 each. Right, Champion "Milson O'Boy," Irish setter. Bottom, left, dog models oil-silk raincoat. Right, this one's worth half his weight in gold



Owned by J. Blakelee Kemel

ing collies, which are sheep or herd dogs. Many an American has gasped at first sight of the basic collie breeds, the "border" strains which are usually small, wiry, black-and-white dogs with roundish skulls, small legs and catlike hairy feet. For centuries these collies have been trained to herd sheep and cattle. They are evaluated by "type" and training. Intelligence and suitability to a given topography and kind of livestock, rather than size, carriage or color, is the basis of type. As a rule, trained working collies are more valuable than show collies, and a good sheepdog, regardless of his breed, is frequently worth \$500, \$1,000 or as high as \$2,500. Many highly valuable working dogs are not even purebreds. One of the

most valuable sheepdogs in the United States, owned by K. L. Burton, sheep rancher of Santa Rosa, N. M., is an amazing cross between a setter and an English bull.

Our official dog directories now list all collies as working dogs and include twenty-five other great breeds: Belgian, Shetland and English sheepdogs; German shepherds; "sledpullers," such as Siberian huskies, Eskimos and Newfoundlands; utility or watchdog breeds including great Danes, St. Bernards, Welsh Corgis, giant schnauzers, mastiffs, bull mastiffs, Doberman pinschers and boxers.

Meanwhile working dog prices gain with their more competent training, which

(Continued to page 135A)



Top, left, "Dah-Boo," prize-winning Pekingese. Right, "Nun Soe Duc de La Terrace," a winning poodle. Bottom, left, working collie, sire of many valuable dogs. Right, taxidermists preserving a faithful dog

*Spotted Aimer
Hodgson Bradford*

*Hatchko
Hatchko*

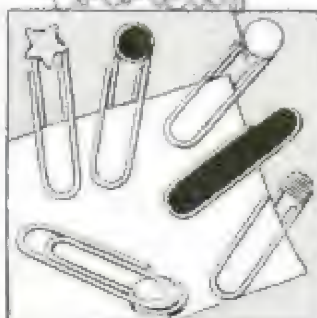
Slot Machine for Shaving Tools Deals Razor, Towel, Soap



Travelers caught short of razor blades drop a coin in this slot machine and get blade, towel and soap

Practically everything but the shave itself is offered by a coin machine developed for use in trains, boats and hotels. The traveler can drop a coin in the slot and buy a razor blade, towel and soap.

Clips Made to Identify Papers by Color or Small Disks



in assorted colors, of coated wire. Another is the codaclip which has a circular disk

of plain or colored material attached at one end. A third is the signalclip, which has a small oblong or square disk of plain or colored material at one end, and the fourth is the adverclip, which has a long oblong covering of either plain or colored material on which a small advertisement or other identification may be placed.

Refuse Truck Body Rotates for Packing and Dumping

Making use of a rotating body to facilitate packing and dumping, a garbage truck recently introduced in England eliminates practically all human contact with the load. The truck has a capacity of about five tons and is equipped with a two-compartment body. The smaller or rear compartment is a hopper which is loaded by a man on the ground. When it is filled the rear end of the body is rotated upward by a power-operated screw through an arc of about 110 degrees, causing the garbage to slide forward and drop several feet to the bottom of the large storage compartment. Thus is accomplished the packing and consolidation of the load. When the loaded truck reaches the disposal plant the front end of the body is rotated upward by the power screw through an arc of fifty degrees, causing the load to be dumped out by gravity.



Here is new-style garbage truck with body tilted to pack the load

Cab Protects Tillerman of Hook-and-Ladder

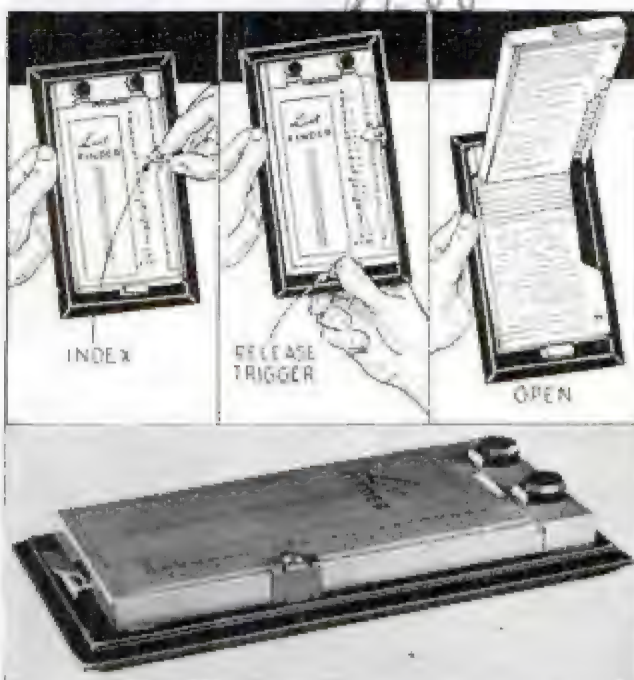
For protection of the tillerman from the weather, a cab-type steering post has been developed for use at the rear of hook-and-ladder fire equipment. The tillerman sits in that cab and helps the driver maneuver the big fire-fighting vehicle around corners by steering the rear wheels. The steering wheel is on the same angle as the front driver's. An unbreakable windshield protects the tillerman from wind and rain. A safety lock allows the complete assembly to rise by spring power, releasing the aerial ladder.



Top, cab in which the tillerman rides on latest hook-and-ladder truck. Note how windshield protects him from weather. Bottom, fire truck with tillerman's cab shown in place at the rear

Handy List Finder Springs Open at Index Letter Desired

Handy for home or office, a spring-operated list finder opens at the touch of a control. All the user has to do is to slide a



Set the arrow at letter desired, press trigger and index pad flips open

red arrow to the letter desired and press the spring control. The list finder flips over to the letter selected and eliminates hunting for name, telephone or other data. Cards in the device have 1,380 spaces for phone numbers, names, addresses, price lists, rates, recipes, formulas, customer lists and countless other lists and data.

Clickety-Click of Train on Rails Silenced by Diagonal Joint

Over a two-mile stretch of track near Tucson, Ariz., the familiar "clickety-click" of train wheels is suddenly quiet and the train rolls along almost noiselessly. The Southern Pacific company is experimenting with a mitered rail joint to end the pounding of wheels on the conventional square-cut joint, with its heavy wear and tear. Each rail end in the two-mile length is cut diagonally, and the wheels roll smoothly on to the tip of the next rail before they leave the tip of the last.

Bates Mfg. Co.
30 Vesey St.

Carl Burke
2540 Wakefield Ave.

165 Broadway New York City

Rubber Tires for Mower Fit Ordinary Wheel



Here are demountable rubber tires that you can slip on and off the lawn-mower wheels without a tool

Rubber tires that slip over the metal wheels of your lawn mower are now available. They are made in various sizes and are easily put on the wheel without tools. These tires protect the metal from breaking against fences and other obstacles, they are quiet and afford better traction.

Foreign Cars' Speed Traced to Alcohol-Benzol Fuels

Racing drivers and automotive experts seem to agree that one of the principal factors in recent victories of foreign cars on American speedways is their use of formula fuels instead of gasoline. Two elements used in these fuels, which apparently give the foreign cars superior efficiency, are alcohol and benzol. One formula used at the Roosevelt Raceway in the 1937 event contained no gasoline. A French car burning this fuel gives its highest performance on a fifty-fifty mixture of alcohol and benzol, with a small amount of ether and castor oil added. The oil is for upper-cylinder lubrication. Most of the other foreign car formulas contain from ten to twenty per cent of aviation gasoline, with varying amounts of alcohol and benzol. One formula calls for eighty per cent

alcohol, ten per cent benzol and ten per cent aviation gasoline. Another contains sixty-four per cent alcohol, twenty-six per cent benzol and ten per cent aviation gasoline, with a small amount of tetraethyl lead added. Foreign racing drivers and mechanics claim that if two cars have equal cylinder capacity and mechanical efficiency, the car equipped to use formula fuel will run faster than the car using gasoline. This is due, they say, to the fact that alcohol is cooler, has a higher latent heat co-efficient and therefore delivers higher horsepower at a given compression ratio. Alcohol is extremely high in anti-knock properties, permitting much higher compression ratios than gasoline. Benzol gives tremendous power and is hot. The proper mixture of the two is credited with the foreign victories.

Cold Created to Test Autos in Summer Heat

While hot weather prevailed outside, ice and heavy frost formed on an automobile in a South Bend factory on a recent summer day. The car was undergoing "cold room" tests designed to determine how well it, and others like it, will start in zero temperatures next winter.



This unusual photo was snapped in "cold room" at the Studebaker factory

Long Glider Flights Test Pilot's Skill, Nerve



Piloting a glider over long distances calls for real skill, nerve and a thorough knowledge of where upward drafts of air may be found and of how to maneuver the motorless plane so that every ounce of lifting power may be extracted from the air. Top, left, glider over New York. Right, Pilot Peter Reidel of Germany stepping from cockpit



Above, Chester Decher, who is noted for long flights, some exceeding fifty miles

Above, sometimes the rope with which the glider is launched into the air by towing becomes entangled. This apparatus for guiding the tow rope on top of an automobile is equipped with a heavy knife which cuts the rope if the pilot is unable to cast it off his ship. Note the close attention with which the operator watches launching to guard against accidents. Right, utility glider making a flight at the eighth annual contest sponsored by the Soaring Society of America at Elmira, New York

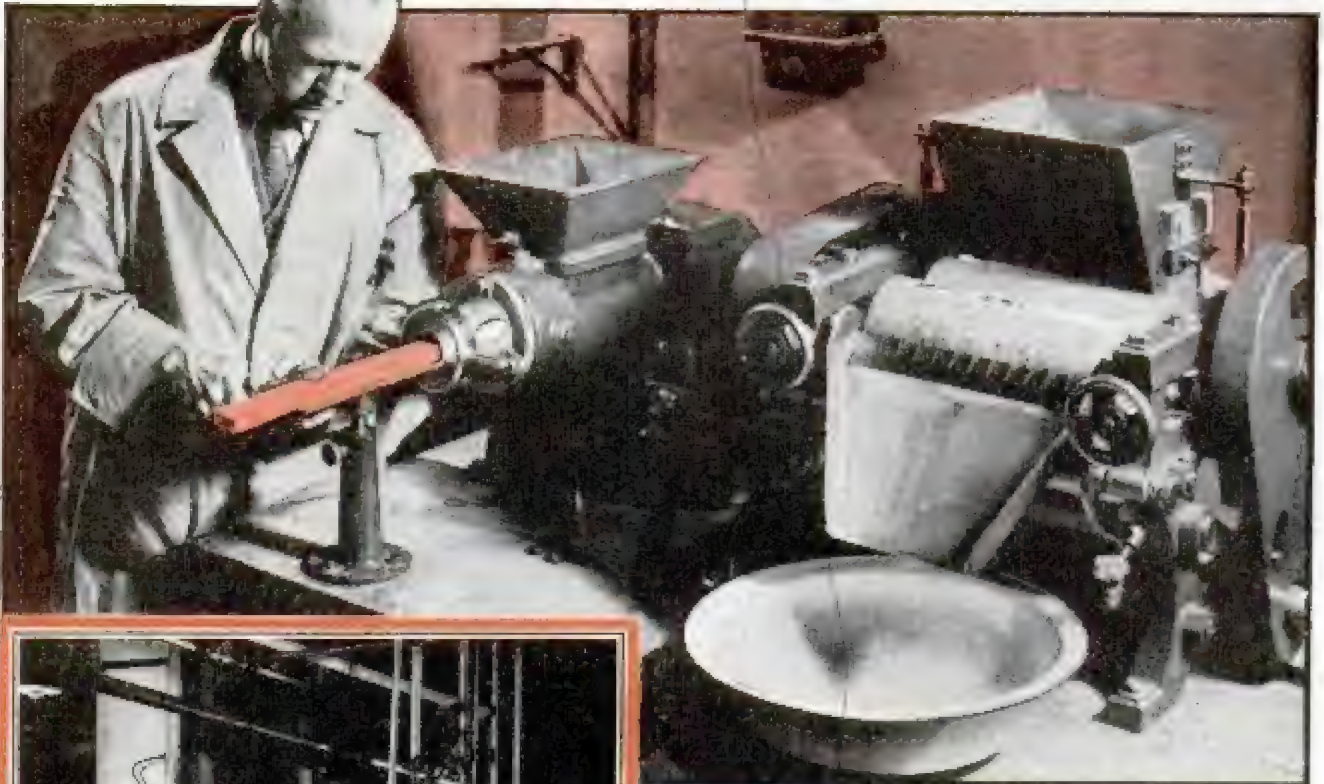


Acme

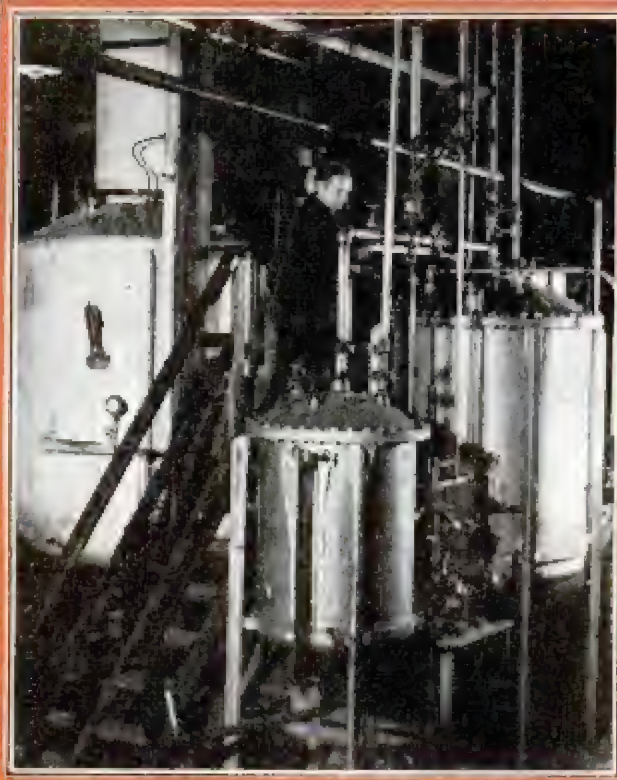
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Wilmington, Del

DOLLARS



Courtesy E. I. du Pont de Nemours and Company
Testing perfumes on soap, above, and, at left, processing a synthetic raw material for perfuming soap



Acme.
By H. W. Magee

NOT so long ago you could identify a can of glue by its smell—and one whiff was enough. But not any more. Sniff at a can of glue today and your delighted nostrils may detect the fragrance of spring flowers.

This glue with the swell smell is just one example of how perfume, once considered only an expensive luxury, now en-

ters into a wide range of everyday products. A few years ago the makers of vacuum cleaners and clothes and automobiles and hundreds of other common articles you buy learned the value of eye appeal. Now everything from toothbrushes to lawn mowers and kitchen ranges is streamline and gaily colored to please your eyes.

Then they discovered it paid to please your ears, too, and began eliminating unnecessary noise from things like cars and refrigerators and oil burners. And now industry has found that the better it smells, the better it sells, and pleasing your nose is becoming quite as important as pleasing your eyes and ears. That's one reason why you may get more perfume today in a ten-cent bar of soap than you could buy with the same dime at a toilet-goods counter.

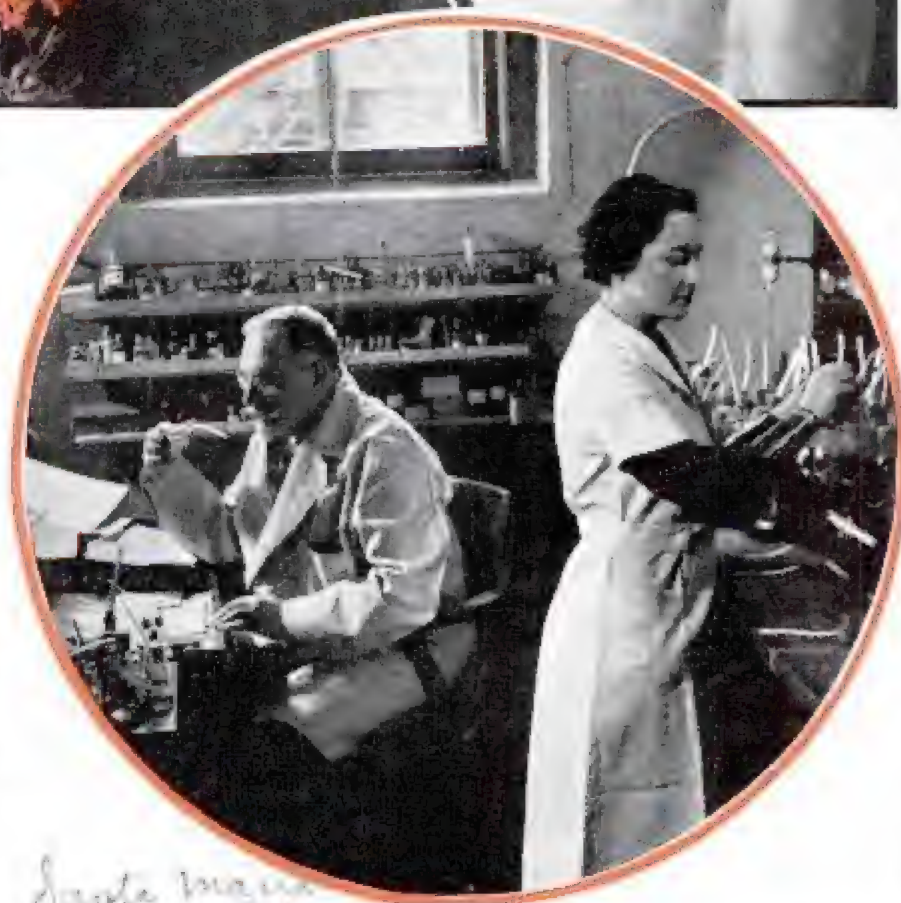
Many things which we consider daily necessities could not be used at all, because of unpleasant odors, except for perfumes. They are used in fabrics to overcome the odors of starch employed for finishing. They go into paint and glue and stationery and linoleum and leather and

and SCENTS



medicines and foods. Some cars are delivered today with perfumed upholstery. A newspaper recently printed a perfumed advertisement, announcing a flower sale, by mixing perfume with the ink.

A perfume for air-conditioning systems gives the air a fresh and pleasant odor. Ballrooms are increasing their summer business by scenting the air with pine oil to provide a cool, north-woods atmosphere and theaters use the perfume of spring flowers as an accompaniment to a romantic thriller. Perfumed tablets scent the water in finger bowls and perfume "pills"



Santa Maria Calif.
Above, high-school chemistry students trying to make their own perfume by distilling oil of flowers. Below, comparing perfume odors in laboratory.



placed on electric-light bulbs give a distinctive fragrance to each room of a home.

Perfume is almost as old as civilization. Man has made and used it for forty centuries. It was employed in ancient Egypt, and Napoleon carried an elaborate array of perfumes and pomades in his field kit. But until very recent years perfumes were made from the oil of flowers and other natural products. The extraction of these oils and other substances was costly, so perfumes were expensive.

The man who has brought fragrance into our everyday lives is the research chemist because most of the ingredients in modern perfumes are synthetics obtained from new raw materials created in the chemist's laboratory. And chemistry has not only duplicated natural scents but has improved on nature by producing alluring new scents unknown to Mother Nature.

Twenty-five tons of violets once were needed to obtain one ounce of violet per-

fume oil and a ton of roses produced only ten ounces of rose oil. Today chemists of the E. I. du Pont de Nemours and Company obtain both these odors from sticky, evil-smelling coal tar and other synthetics. Before these synthetics were available, scents like lilac and lily-of-the-valley were unobtainable because man could not extract the natural oils from these flowers. Now both odors are produced from synthetics and man-made lilac is perhaps sweeter and more powerful than any known natural substance.

During 4,000 years of perfume making, man has tried virtually every possible combination of known ingredients, so a distinctive odor today is rarely the result of a new blending of old ingredients, but usually has for its base a new raw material produced by the chemist. One man obtained from cocoanut oil a substance which formed the base for a brand new perfume and nearly every new raw material is canvassed for its perfume possibilities. Chemistry has raised the list of perfume materials from 200 to 1,000 and the number is increasing. Seventy different ingredients are available for the making of lilac perfume alone.

Those who prefer their perfume straight instead of mixed with glue or linoleum used an estimated 80,000 gallons in the United States last year in the form of extracts and toilet waters. In the same period, the soap industry, probably the largest industrial consumers, used perfume materials valued at \$6,000,000.

Perfume making is both an art and a



"Fragranceer" hung on wall to scent room. Above, storage section containing myriad odors for use in synthetic perfume experiments

Ellis Llandson Co
2211 21st St New York

Belroth Co 655
Hills Chicago



Perfume pellet on this lamp is dissolved by heat and scents entire room. Above, picking roses in Bulgaria to make perfume oil

science. The materials are supplied by the chemist whether he extracts them from natural products or creates synthetics. But the blending calls for an artist and the perfumer works by inspiration. He has no guides except his instinct and his nose. There are no instruments to tell him when he has created the alluring scent for which he strives. His nose, as sensitive as the tongue of the tea taster, must tell him when he has the right composite effect and must also smell out and analyze the effect of each individual ingredient upon the blend as a whole.

Three general ingredients enter into every perfume, the odor elements, usually several in number; the diluting agent, generally alcohol, and the fixative which blends the many odors into one scent and confers permanence on it. The fixatives formerly were of animal origin and included such substances as musk, civet, castoreum from beaver and ambergris from whales. Now, due to chemistry, most fixatives, like many basic odors, are synthetic.

Four general types of odors also enter into most perfumes. Odors are classified

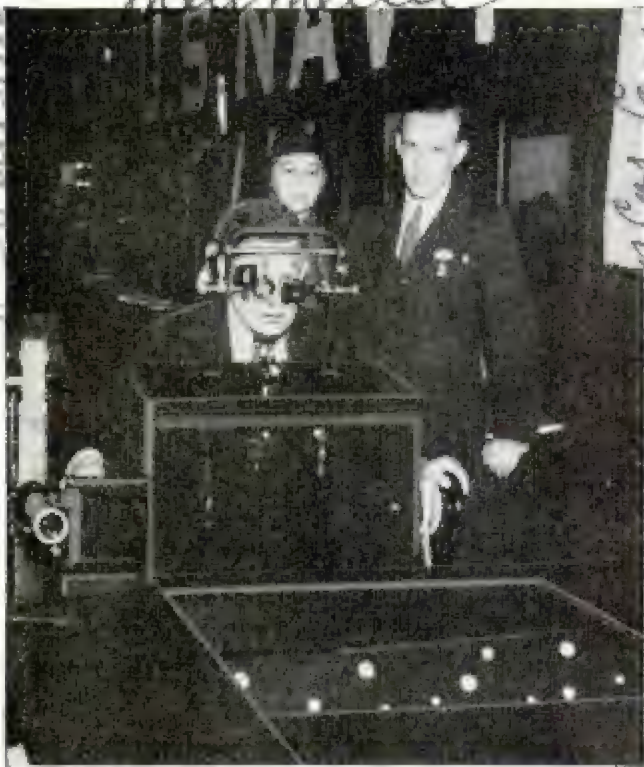
as sweet, acid, burnt and what is known as goat odor. It usually requires a combination of all four types to obtain a pleasing scent and some of the most valuable perfume materials are extremely evil-smelling. The most popular perfumes today contain a large percentage of these unpleasant odors.

The principal odor of any perfume, in addition to being pleasing, must also be subtle because a strong scent, even if pleasing, quickly paralyzes the sense of smell. This is why the delicate scent of the better perfumes can be noticed a long time while the stronger odor of inexpensive perfume seems to vanish.

Flowers, the roots of plants, trees, barks, gums and resins, seeds, leaves, stems, grasses and fruits supply natural perfume oils which are extracted by distillation, by using volatile solvents, by squeezing or by enfleurage, a method based on the ability of fat to absorb an odor of a flower just as butter absorbs the odor of fish. The perfume then is separated from the fat by washing with alcohol or another solvent.

(Continued to page 140A)

Glasses Test Pilot's Vision 'Landing' on Tiny Field



Flier takes vision test by guiding "plane" while he sights miniature airport through optical instrument

Lives often depend on the unerring eyesight of airplane pilots who must bring planes to earth under poor visibility conditions. A special optical instrument has been devised to test the vision of aviators. The pilot faces a miniature airport lighted with tiny lamps. As he sights the field through the glasses he must guide his "plane" to land with a small wheel.

Invisible Light Reveals Structure of Atoms in Elements

Infrared light is turning its invisible spotlight on the molecule, helping science answer some of its most baffling questions concerning the internal structure of matter. From the studies now in progress with infrared rays the research men hope to learn what happens when rubber ages, how some petroleum products differ from others, exactly what occurs when paint dries and what is the effect and action of catalysts. With an automatic spectroscope developed recently, infrared light can be examined to determine the number of atoms of an element present and how they are connected. Some of the secrets of iso-

meric structure, composed of the same atoms differently linked, are thus revealed, for the isomers show different sets of spectral lines as proof of their individuality.

Radio Controls in Armrest of Latest Sedan

For convenience of passengers in the rear seat, radio controls are set into the armrest of the latest sedan-type automobiles. The controls enable the passenger to operate the radio, making it unnecessary for the driver to take his eyes from the road and his hands from the wheel.



Vegetable Knife Blade Is Looped for Coring or Peeling Food

In the canning season, housewives find the latest type of vegetable knife especially handy in coring fruit and vegetables and cutting out bad spots in preparation for preserving. The knife has a looped blade which makes it versatile. It is useful for slicing and peeling, removing berry stems, carving fruit or vegetable in decorative designs, and hollowing out foods for salads.



Here are some uses of this versatile vegetable knife

Barker Talks to 'Mike' on Rubberneck Train



While the conductor collects tickets on the "rubberneck train" of the Central Railroad of New Jersey, he is introduced to the passengers by name over the loudspeaker. The "barker," seen above at microphone in baggage car, describes points of interest as train passes.



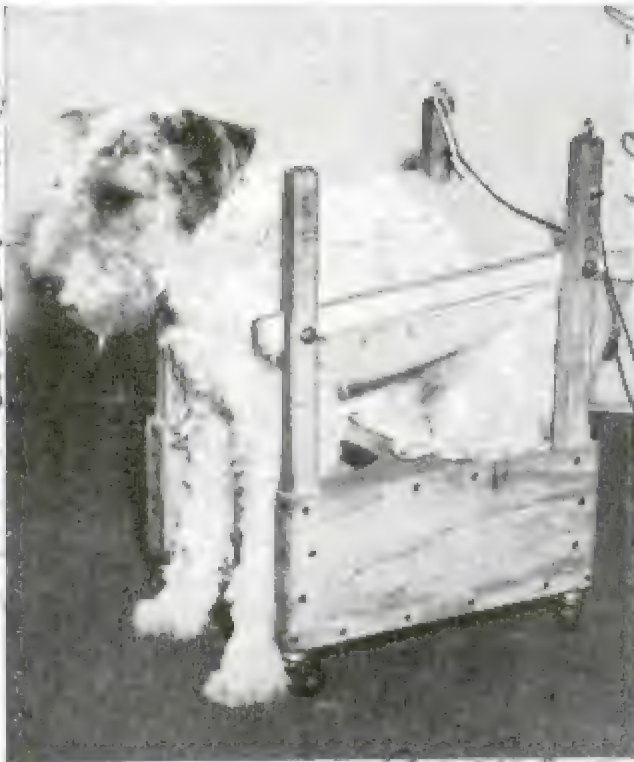
Loudspeakers are installed in every car of "rubberneck" sight-seeing train. Dining-car waiter, left, announces dinner with gong on microphone instead of walking length of train. Even at tables in dining car, above, passengers hear "barker" reading prepared script giving historical bits and information about passing scene. Musical selections are given at intervals, and occasionally a "mike" in engine cab is cut in to bring the voices of engineer and fireman, roar of locomotive and shriek of its whistle into the cars. These rubberneck tours sometimes cover 300 miles.

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87 41-832
Cant. Andrew Halligan

143 Liberty
New York

Disabled Dog Walks Again Supported by Carriage



Snoopy has only two good legs but this homemade rolling support makes it easier for him to get around

Stricken by paralysis a year ago, Snoopy—a wire-haired terrier in Los Angeles—is learning to get around with the aid of a special "baby carriage" built for him by his master. An adjustable support carries the body of the two-year-old dog. It rests on a frame rolling on casters, and Snoopy can walk on his fore legs dragging his carriage behind him.

Radio Detector Finds Lost Pipe Buried in Oil Fields



Thousands of miles of water, oil and gas lines were laid helter-skelter in the boom days of oil development in Oklahoma and Texas. In the haste, maps and blueprints were omitted or lost, and the location of the buried pipe lines was forgotten. Today, however, high taxes and the rising value of salvage have made it desirable to find the disused lines, and a

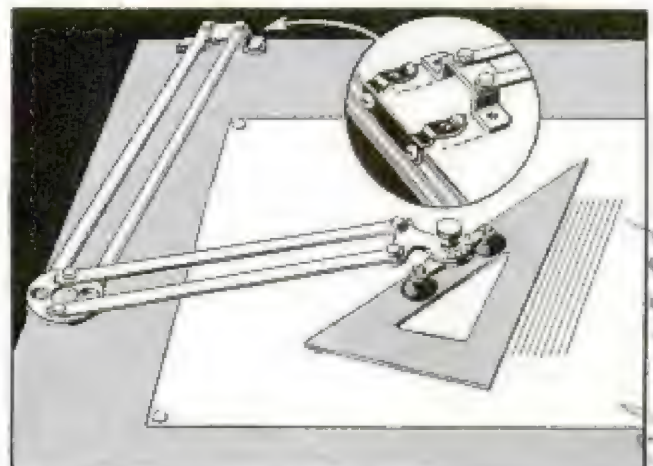
radio detector has been developed for the purpose. It consists of a seven-pound receiving set with batteries and earphones, carried by a pipe linewalker. A ten-pound transmitter is set down with one spearhead on a pipe and another at a vertical distance of 100 feet. Through distinct signals, any pipe one-eighth inch or larger can be followed through a maze of other pipes, and cross lines are located by signals in the earphone.

Hot-Air Motor Supplies Radio with Electric Current

Designed for use where electricity and batteries are not available, a hot-air motor generates current to operate the radio. Invented in Germany, the motor is heated by an oil-burning lamp and requires no other source of heat. It makes no noise and needs no attention after the wick is lighted. The motor-generator, which supplies direct current, will be marketed in sizes ranging from five to fifty watts.

Vacuum Cups Hold Triangle to Parallel Arms on Board

Two rubber vacuum cups mounted on the end of a set of parallel arms offer a simple means of gripping the triangle or ruler for drawing parallel lines and angles. This draftsman's tool, put on the market recently, can be screwed on the drawing board or merely slipped into place with a clip. After setting the triangle at the desired position and fastening the vacuum cups, a thumbscrew is tightened and the draftsman can go to work.



Vacuum cups hold triangle at desired angle when thumbscrew is tightened. Inset shows table clamp

*Metal & Peculiarities Co.
2200 11 Carroll St.*

Six Thousand Alligators Move to a New Home

It's no job for an ordinary moving-day crew when six thousand alligators pack up and move to a new home. For nearly forty years the alligator farm at Jacksonville, Fla., has been an attraction to tourists, and when it was sold recently to Daytona Beach interests someone had a ticklish moving job



Alligator "cowboys" roping a big one on moving day. First the jaws are bound, center; then, top, crew ties up legs and powerful tail that could kill a man. Below, the giant reptile, lashed to boards, is carried by seven men to motor truck

to handle. The 6,000 included all sizes from twelve-inch baby alligators to husky twelve-footers weighing more than a ton. For the dangerous assignment of roping and shipping the 'gators they picked Ross Allen of Ocala, Fla., an alligator wrestler and expert at "milking" rattlesnakes of their venom. He supervised the operation

of binding first the toothy snout, then the legs, and finally the huge tail. This latter job is a particularly perilous one, for the 'gator can easily cut a man in two with a lash of that heavy tail. When they were securely fastened the captive giants were carried on boards by seven-man crews to motor trucks for shipment.

(Inquiries as to makers of articles described in Popular Mechanics will be answered by our Bureau of Information upon receipt of return postage.

Spool and Ahbe Film Corp.
4911 N. Broadway, Chicago



MAGIC LANTERN



Top, projecting the slide-film. When the accompanying dialogue calls for a change of picture, the operator merely pulls a string. Below, making subtitles and developing the film

YEARs ago you tossed the old magic lantern on the rubbish pile and said farewell to the era of "still" pictures on the screen. Movies were here, and the magic lantern was old stuff. You never expected to see it again.

But it is back today—the magic lantern with "talkies;" a baby industry that is fast growing.

At home, you can throw on the screen before your friends a story in stills, a sequence of your most prized photographs in black-and-white or full color, synchronized with a sound accompaniment and lecture on a wax record that you can make yourself.

In business, you can use the new sound

slide-film to project pictures and charts before sales meetings, conventions and customers while the wax disk, your "master salesman," furnishes a background of dialogue, inspirational talk and music. A dozen sizable companies are profitably engaged in producing these disk-and-film programs; thousands were turned out commercially last year, and there is no telling how many were produced by the young industry's growing gallery of amateurs, who do it just for fun.

The last traveling stereopticon show starved out of business about a quarter of a century ago. The magic-lantern "talkies" of today are only a distant relative; they are really the child of the movies and

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Comes Back with **TALKIES**

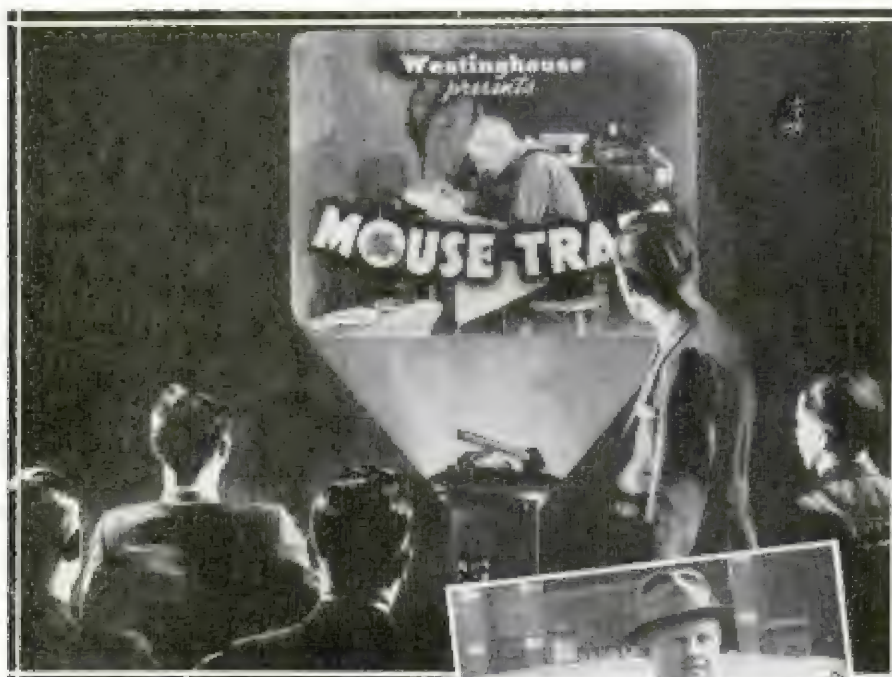


radio, for they employ motion-picture size film with the mechanism of radio transcription. They do things the movies cannot do, and yet the most elaborate slide-film program, conceived and executed professionally, costs only about one-fifth as much as a movie of the same length: a fifteen-minute show for about \$1,500. Your home entertainment program can be produced for far less.

All you need to exhibit a slide-film talkie is packed in a handy box smaller than a suitcase. Unfold the equipment, plug the electric cord into a wall socket, and the show is on. The projection apparatus is available for less than \$100, suitable in volume, in candlepower and projection qualities for an audience of two in the basement recreation room or an audi-



Top, all set to shoot a scene for the "talking magic lantern." At center the strip film is being sponged and printed, then it is filed in tiny metal containers seen at right. Bottom, radio announcer at the "mike," making sound record to accompany the film



ence of two hundred in a theater.

This slide-film industry is attracting experts from a dozen different fields. Movie directors are quitting Hollywood to produce commercial magic lantern talkies. Magazine writers are called in to write script for the dialogues and lectures. Cameramen, sound-effects men, sales and advertising experts are attracted to the new field.

Perhaps you are the head of a marketing firm in New York with an important technical message you want to put across to your offices in Dallas and Memphis, Minneapolis and Seattle. Two or three years ago you would have had the message printed and mailed to those offices, hoping it would be read and understood. You would have depended on district managers to call meetings and deliver your message to the staff. Now, instead, you turn that message over to the slide-film producer. A script writer decides the most suitable medium—an illustrated lecture, a playlet, a dramatized bit of fiction. The writer specifies seventy-five pictures for a fifteen-minute program, each picture on the screen accompanied by thirty to fifty words on the disk. Actors may be assigned to pose for the pictures.



The sequence of photographs, originally six by eight and one-eighth inch prints, is arranged in story-telling order and then reproduced on a single strip of thirty-five millimeter film, five or six feet long. Meanwhile the script has been put on a record by a radio-trained announcer. If it calls for dramatic dialogue, several men and women announcers may participate. In this way the carefully prepared lines are spoken better than your own company representatives could speak them.

During the recording, the sound director who follows the script and the voices strikes a bell at the end of each paragraph. The sound of the bell on the record divides the script according to the pictures on the screen. Then, when your Dallas



All the necessary equipment to put on a "show" is carried in this light, compact folding case

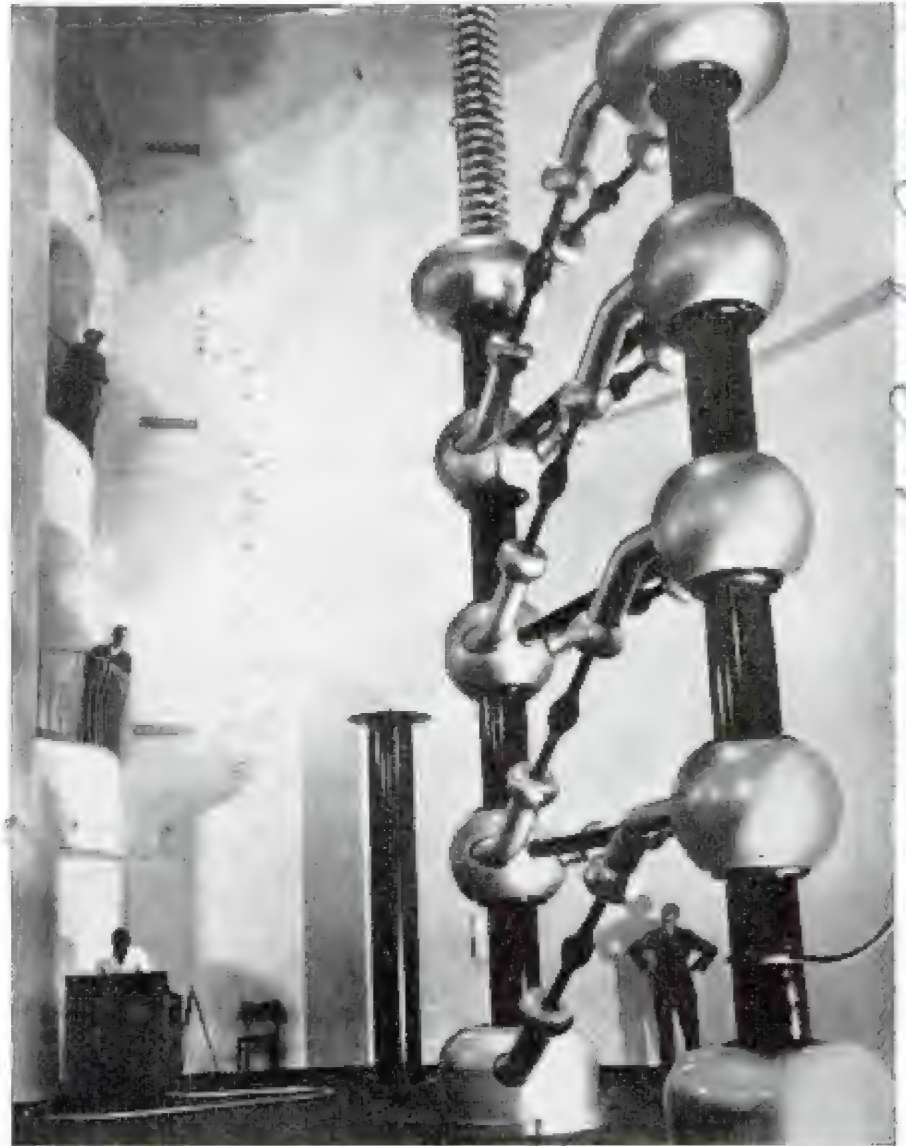
manager assembles his staff to see and hear your message, they hear a clear, eloquent presentation synchronized with the pictures you have chosen. All he must do is to start the film into the projector and set the record playing. When the bell sounds, he pulls a string to change the picture on the screen.

Disk records are made in several convenient sizes ranging down from a diameter of twelve inches. Recorded much slower than phonograph records, a fifteen-inch disk plays for fifteen minutes on either side, a twelve-inch record for ten minutes. Positive film prints, rolled up and packed in tiny tin "pill boxes" fit into a square mortise in the corner of the corrugated paper carton containing a record. Thus you can ship film and record together by mail.

Slide-film talkies are not just cheap substitutes for the movies. They have some distinct advantages over the motion picture. A gasoline-engine manufacturer recently wanted pictures of a running motor to study its mechanical operation. Several reels of moving pictures were taken, the movie camera being synchronized with the motor. Then from these reels certain frames were cut to be used as stills, permitting the engineers to "stop" the motion of the engine for study on the screen. Stills are obviously better than movies for exhibiting a mechanical drawing, a chart or a table of figures. They give the audience time to study. They present a clear image while the audience listens to an explanation. The "canned pep session" for sales promotion is the biggest field for the commercial slide-film talkie. And the home

(Continued to page 126A)

Fifty-Foot "Atom Smasher" Shoots Man-Made Lightning



Here is the giant lightning machine which science will use in bombardment of the atom in attempt to reveal its secrets

Employing man-made bolts of lightning a fifty-foot "atom smasher" is being used by Berlin scientists. The giant machine, which handles electrical discharges of three million volts, may be the means of prying into the secrets of the atom. The scientists hope to smash the atom, with the aid of the machine, and release its vast energies in a form which may be harnessed and put to work for mankind. A windowless tower, 135 feet high, houses the artificial lightning machine at the Emperor, Wilhelm Institute of Physics.

☐ The smallest wire in an electric meter is one-fourth as thick as a human hair.

Westinghouse Electric

under direction of Prof. Peter

Bel lows and Forge Rigged from Refuse of Beach



Prospector working with rude bellows and forge built of refuse picked up along ocean shore

Necessity being the mother of invention, a prospector on a British Columbia beach fashioned an ingenious bellows and forge from odd bits picked up along the shore—two old butter boxes, scraps of iron, canvas, leather, wood and pipe. He needed the forge to build a float to which he could tie his boat off shore. He made the bellows from the butter boxes, one slightly smaller fitting into the larger box to form the air chamber. A hole was cut in the lower box and covered with a piece of tin on canvas hinges to form an intake valve. In the opposite side a smaller hole was cut,

with canvas flap, for the outlet valve. An air chamber for the outlet valve was made by cutting a hole through two pieces of two-by-four and nailing them on the box. A two-foot length of inch pipe from an old donkey-engine boiler was fitted into the two-by-four and the fireplace built around with rocks and blue clay. This simple forge was built with an ax, hammer, saw, brace and bit and jackknife.

Electric Battery Stock Driver Aids in Controlling Animals

Designed to produce a 2,200-volt current of such low amperage that it does not burn or blemish the animal, an electric stock driver is available for shippers, dealers, packers and truckers. It operates on a twelve-volt dry battery. The shock is delivered through a thirty-two inch rubber handle connected to a box which is carried over the shoulder. The handle fits into a holder on the box when the operator desires both hands free. The driver eliminates clubbing and beating of stock, which frequently results in spoilage of meat.

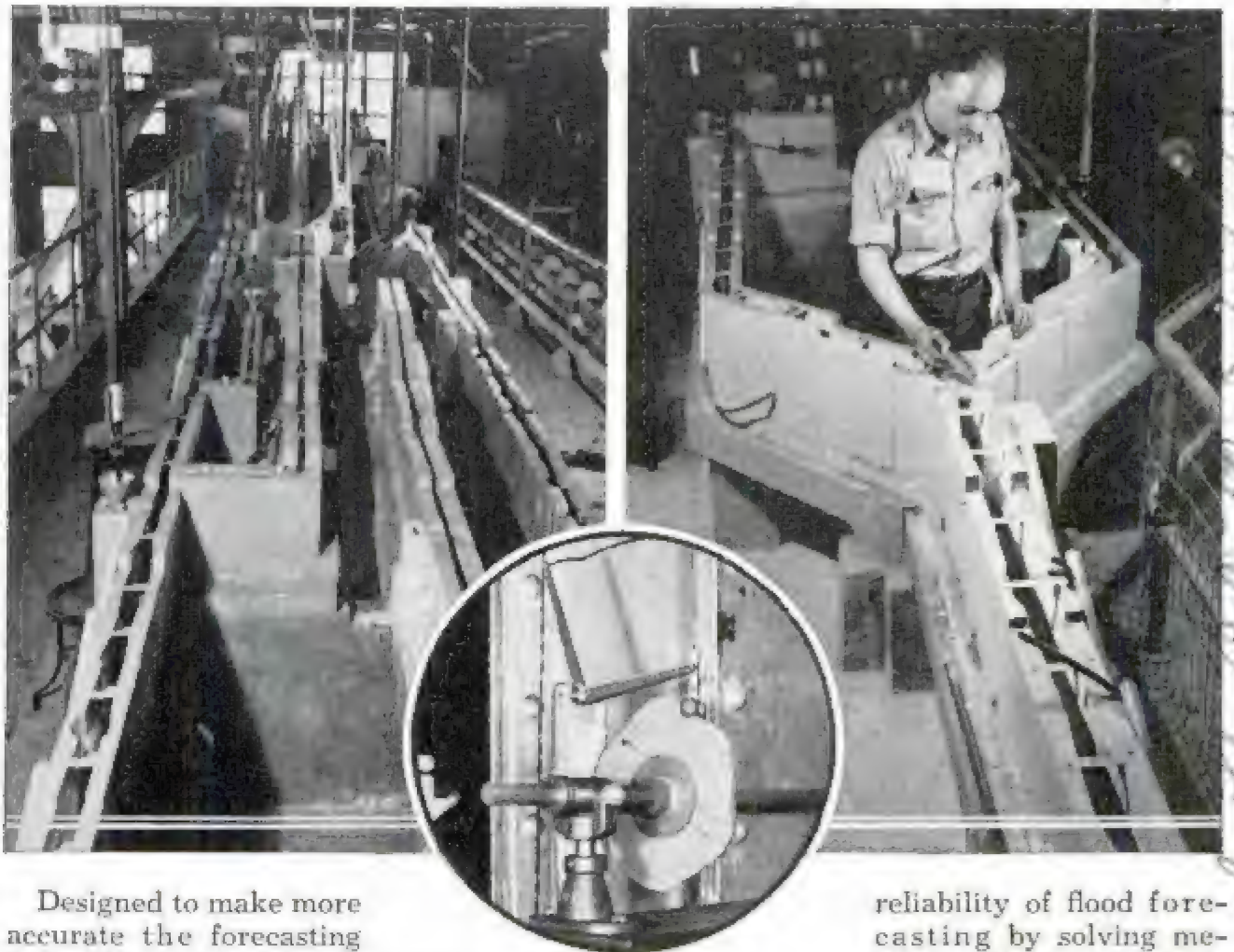
Autogiro Tries Out Two Rotors in a Test Whirl in Germany

Juan de la Cierva, inventor of the autogiro, did not live to see his idea develop into a twin-rotored ship. Designed by a German, an autogiro rose from the Bremen airport the other day under the power of two huge three-blade rotors. Like the latest United States models of single-rotor autogiros, this ship is wingless.



Twin-rotored autogiro leaves the ground for a test whirl over the Bremen airport in Germany. Observe its wingless framework

Model's Miniature Floods Aid in Forecasting



Photos by William Knux

Left, general view of hydraulic integrator. Right, operator stands at point corresponding to Pittsburgh's location. Circle, one of the cams which regulate flow of water in the model

Designed to make more accurate the forecasting of floods, a model of the Allegheny, Monongahela and part of the Ohio river basins is being used by government engineers in the Pittsburgh district.

Called the "hydraulic integrator," the model is eighty-five feet long and six feet wide and its highest point is ten feet above the lowest. One inch of width or length on the model is equivalent to more than one-quarter of a mile on the actual river system, while one inch in depth represents six and two-thirds feet. Rivers and their tributaries are represented by deep, narrow gorges equipped with brass baffles to make the water flow at the correct depth. The run-off from the drainage basin of each important stream is mechanically controlled by a cam shaft which revolves once in what would correspond to a week's time in nature. The cams may be changed so that a flood of any size or peculiarities may be portrayed by the model. The hydraulic integrator is expected to increase

reliability of flood forecasting by solving mechanically the complicated differential equations which govern the movement of flood waves. Thus, given accurate data on rainfall, snow and

run-off, the model may be set in operation to determine quickly the correct stage at Pittsburgh and the time it will arrive. The model also will help to determine the best location and height of proposed flood-control dams. It represents 23,250 square miles of drainage area in New York, Pennsylvania, West Virginia and Ohio, yet it is small enough to place indoors. Among the novel features are the cam-controlled valves by which the correct run-off may be obtained from all the tributaries simultaneously and the baffles by which the correct roughness of the stream beds can be reduced to scale. The model, which was designed by H. A. Thomas, professor of hydraulic engineering, is in use at Carnegie Institute of Technology. It was built by the corps of engineers, U. S. army.

Dr. Carl D. E. Correll
 Director
 Stanley Park
 Pittsburgh, Pa.

Navy's Latest Bombing Plane Attains High Speed in Tests

Curtis SBC-3



Here is the navy's new scout-bombing plane in flight. Note smoothness of lower fuselage when landing gear is fully retracted

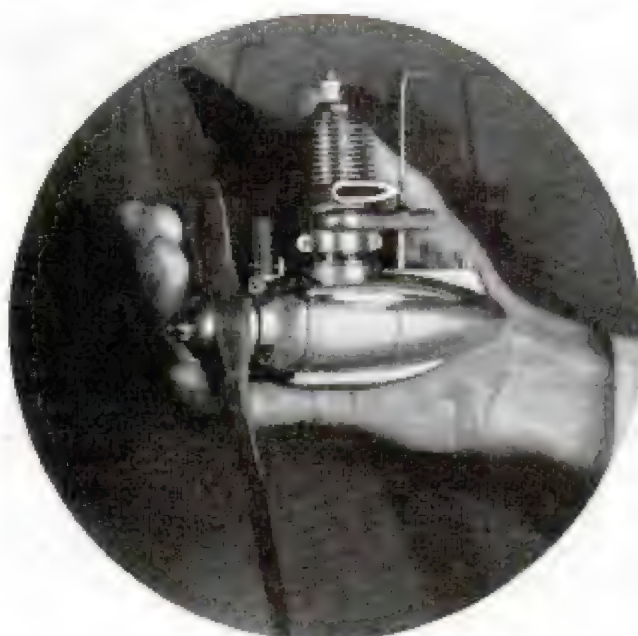
Powered by a "twin wasp" motor, a new scout-bombing plane recently tested by the U. S. navy is said to be faster than any ever used in that service. Eighty-three of the ships have been ordered by the navy. Among the plane's features are tandem cockpits for a crew of two, full retractable landing gear and an all-metal fuselage.

Floor Built of Precast Concrete Saves Cost of Forms

Dead load savings as high as forty per cent are achieved in building floor and roof decks by a system just patented by a Chicago architect. Foundation and steel framing costs are reduced, all form work is eliminated and weights are cut in half compared with conventional concrete construction without sacrificing strength. The system is a combination of precast lightweight concrete slabs and beams cast in light sixteen-gauge hollow-steel sections filled with concrete on the job. The effect is that of a monolithic T-beam. Strong reinforcing mesh projects from the slab ends which are embedded in the beams in the

© Eugene B. White

ing rod are aluminum alloy, the cylinder of steel, machined to .0001 inch. The crankshaft is counterbalanced. Long life and easy starting are assured by coils especially developed for the engine. Each engine is individually tested at the factory.



Small enough to be held in the hand, this engine drives model airplanes

form of stirrups, making the reinforcement of beams and slabs continuous. Spans up to twenty-seven feet can be taken care of for ordinary floor loads, and by slightly increasing the size of beams and tension bars running through them, the floors can carry as much as 250 pounds per square foot. In a breakdown test conducted recently, one of these monolithic floors required a load of 564.6 pounds per square foot of uniform loading to cause failure.

Tiny Engine for Model Plane Weighs Eleven Ounces

Complete with gasoline tank, a one-fifth horsepower streamline engine for driving model planes weighs only eleven ounces. It has a motor speed of 1,000 to 10,000 revolutions per minute. Piston and connect-

Eugene White, 4609 Syncro Steves, Inc. Educational Bureau 743 Beantree, S

Diesel Mail Ship Seats Passengers Like a Bus



Streamline Diesel motorship built as passenger ferry and parcel carrier for Norwegian line. Notice seating arrangement, right



All steel and electrically welded, a Diesel motorship put in service recently by a Norwegian shipping company has twin rows of seats arranged, like a bus, on each side of the passenger deck. It is a trim looking, streamline hundred-foot craft of fifty gross tons, built to carry mail and light parcels besides 160 passengers. A six-cylinder Diesel engine of seven-inch bore and nine-inch stroke propels the boat at a service speed of thirteen knots.

Airways Program to Cost Seven Million Dollars

Involving the expenditure of more than \$7,000,000, the Bureau of Air Commerce, department of commerce, has launched a program of airways modernization and improvement. Among the items on the program are: modernization of existing full-power radio stations; purchase of engine generators for emergency power supply; installation of remote receiving antennas; installation of ultra high-frequency radio location markers for cones of silence and airport traffic control; conversion of non-directional radio mark-

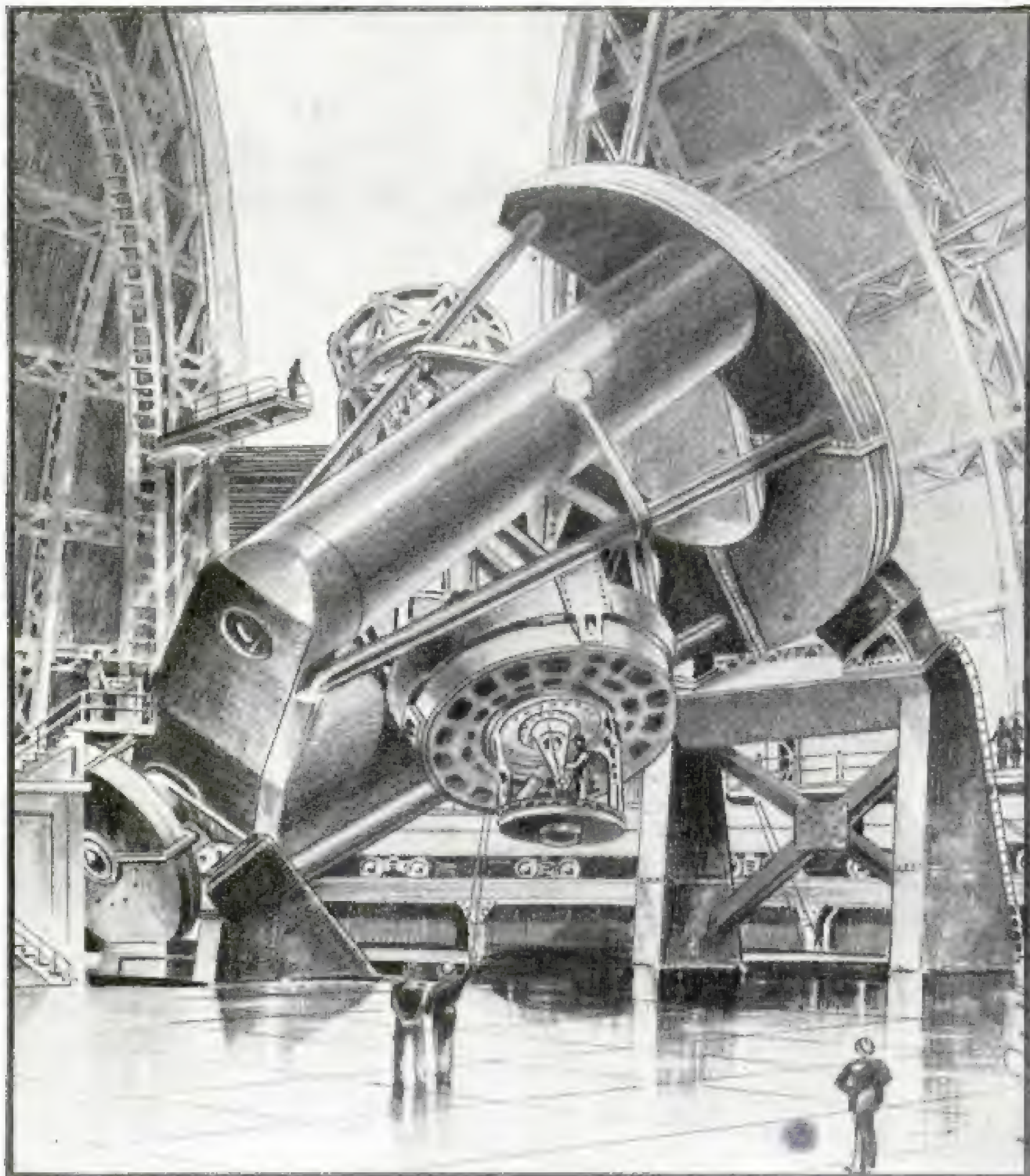


ers to directional or ultra high-frequency type; installation of additional radio stations to fill in gaps on the airways; installation of equipment to permit control shift between day and night frequency, and, miscellaneous airways lighting relocation, plus a small amount of additional lighting for the airways.

Buller 7/15/37

esb 74

A Million-Pound "EYE"



Courtesy Westinghouse Electric & Mfg. Co.

This drawing gives a general idea of how the mighty telescope will look when it is assembled atop Mount Palomar. Note its massiveness in comparison with size of the human figures

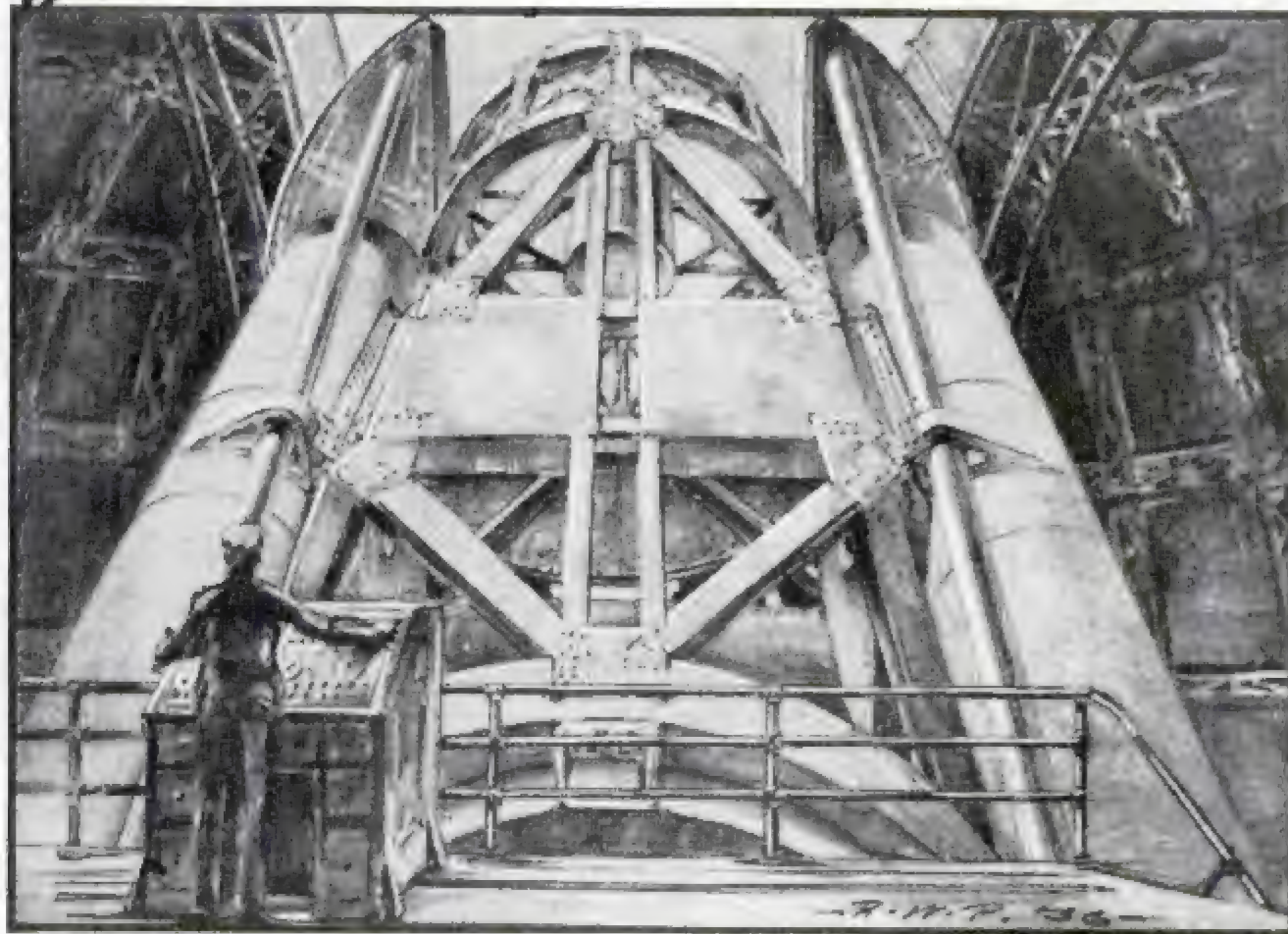
DISTANCES almost beyond human comprehension will be penetrated by the world's biggest "eye," the 200-inch reflecting telescope being erected atop 6,000-foot Mount Palomar in southern California.

With the aid of this instrument, astron-

omers of the Pasadena Calif California Institute of Technology hope to pry into secrets of the universe perhaps a billion light-years away and to bring the moon to within an apparent distance of twenty-four miles of the earth. But scarcely less remarkable than

25674

for STAR GAZERS



This is how the great telescope will appear from the control deck. Note the control board which makes it possible to regulate delicate movements of the watch-like instrument

the vast spaces which will be made visible is the wonderfully accurate construction of the eye.

The essential optical surfaces permitting scientists to project their eyes through space consist of less than one ounce of aluminum and photographic emulsion. But to enable these surfaces to function properly, about 35,000 pounds of glass and 1,000,000 pounds of steel are necessary! The glass composes the mirror; the metal forms the mounting.

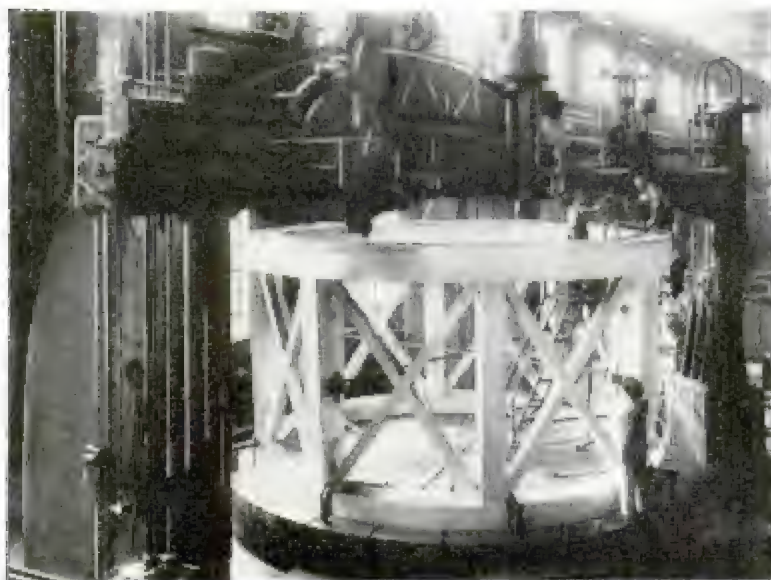
As accurately constructed and with a movement as delicately balanced as the finest pocket watch, this great telescope will be the largest precision instrument ever built. As tall as a six-story building and weighing as much as three big locomotives, it can be kept rotating at a rate of one revolution per day by the amazingly small output of about 1/165,000 horsepower. The current for such a motor would not even register on an ordinary ammeter

but practical operation will require use of a one and one-half horsepower electric motor.

The mounting consists of two main parts, a tube which serves as a supporting structure for the principal optical elements and a cradle or yoke to carry the tube. This tube is an open structural framework carrying a 200-inch mirror at its lower end. Instead of looking at an object from its lower end, an observer riding in a cage in the top turns his back on the object to be observed and looks downward toward the mirror.

Both the tube and yoke are of low carbon steel and were made by the Westinghouse Electric and Manufacturing company, one of the few industrial concerns with plants and machine tools large enough to turn out such huge equipment.

This tube is about sixty feet long and twenty-two feet in diameter. Its weight is about 200,000 pounds and it is formed as a



welded box structure consisting of two main rings tied together by struts. There are eight principal parts, a mirror cell, a bottom ring, four central flat panels, a top ring and a diaphragm cage which supports the observers' cage, the tube thus being square in the middle and round at each end.

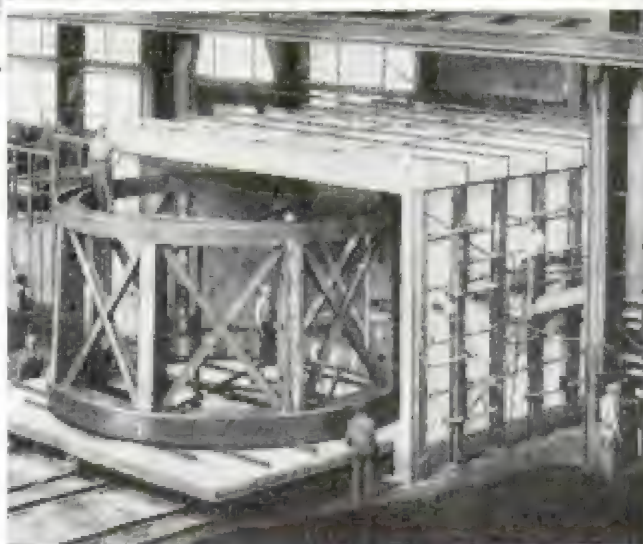
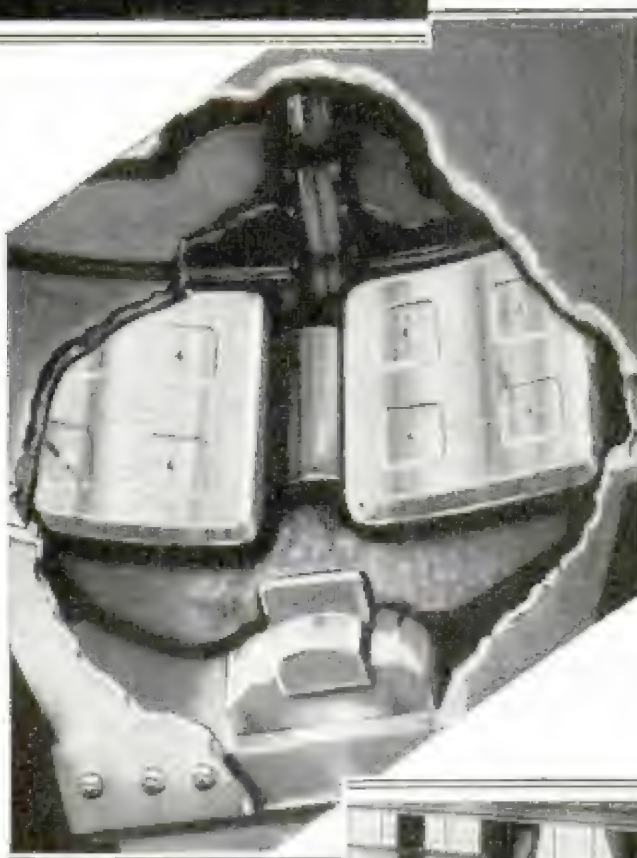
The largest single element in the whole telescope is the diaphragm cage at the top of the tube which is twenty-two feet in diameter and twelve feet high. A special furnace was constructed to anneal this cage and other large pieces. This cage weighs only 26,000 pounds, due to the hollow type of construction.

The various electrically welded sections of both the tube and yoke are bolted to contiguous parts by means of internal bolt flanges. Light collected on the mirror at the bottom of this tube is reflected to the prime focal point at the top, exactly 666 inches from the mirror. However, the optical system will permit the light to be reflected to four main focal points as desired, including one underground air-

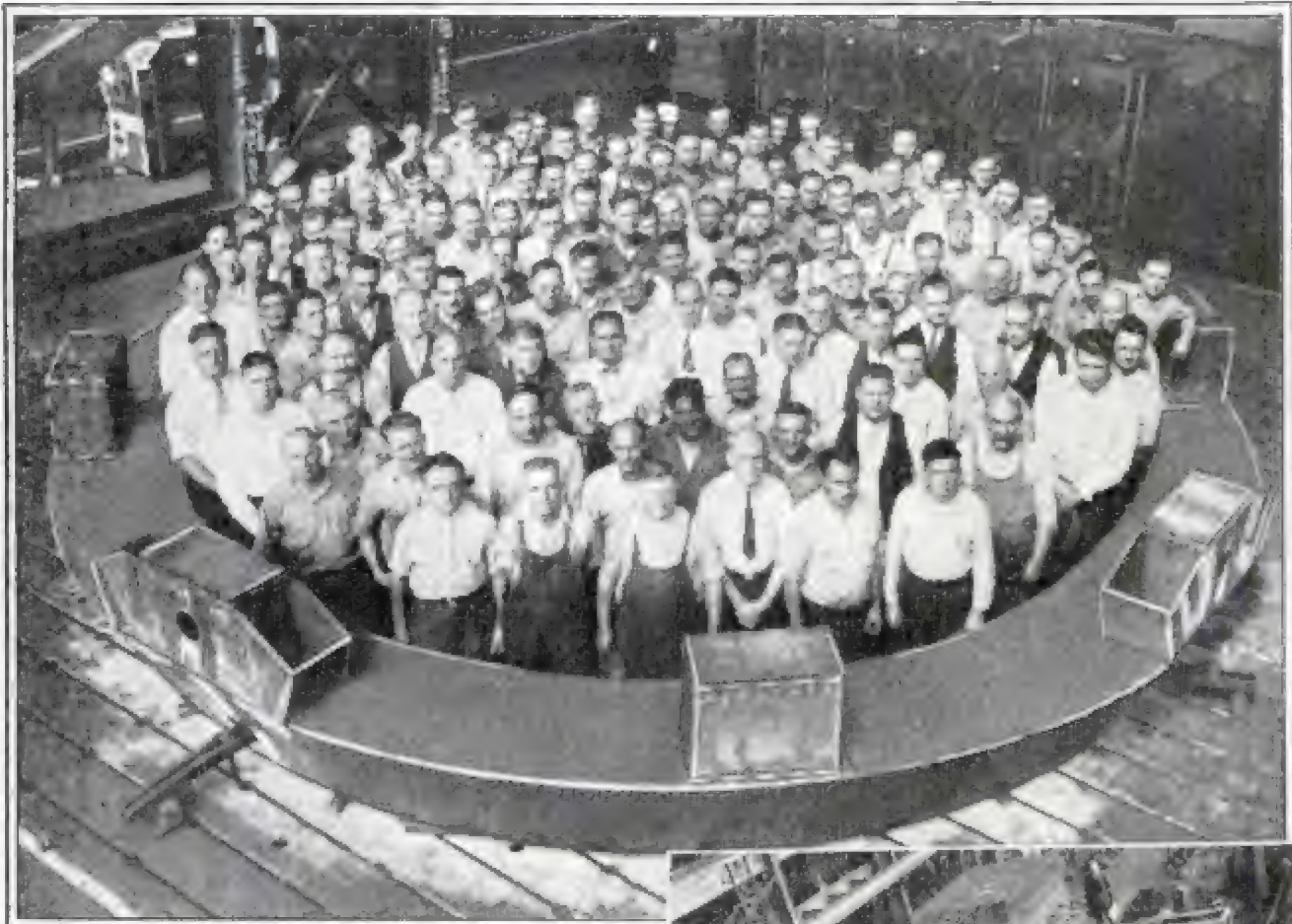
conditioned chamber. The observer's post at the top of this tube is six feet in diameter, split into two compartments so arranged that vibrations in one will not be transmitted to the other. These compartments are hung on knife edges. While the observer may ride in the top of the tube and control it from this point, the electrical system will permit control of the telescope from other points in the observatory.

A unique method of connecting the center of the tube to the yoke

is employed. Instead of the usual spherical seated ball bearings, flexible gimbals and trunnions are used. The spokes of the gimbals are comparatively rigid in tension and compression, but extremely flexible in bending. This leaves the tube free to move on the center box structure and provides virtually two-point support, freeing the tube structure from distortions due to bending forces about the support-



Top, machining the huge cage. Center, oil pads which facilitate movements of the instrument. Bottom, specially built annealing furnace

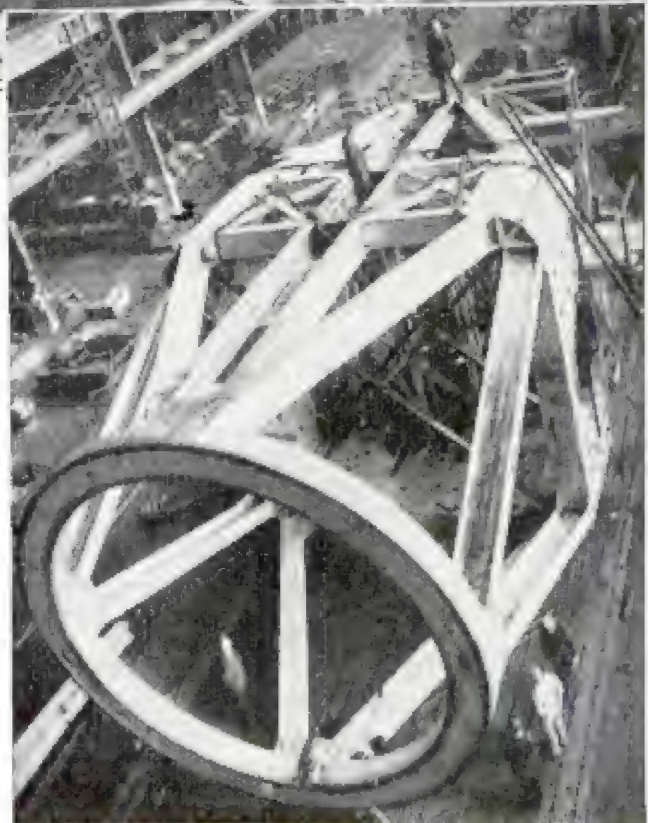


ing points. Gimbals ordinarily are used on very precise measuring instruments.

The dimensions of the tube seem almost puny when compared with the supporting yoke. The yoke is about sixty feet long, forty-six feet wide and weighs about 830,000 pounds. It is to be hung at an angle of thirty-three degrees, twenty-one minutes, twenty seconds, corresponding exactly to the latitude of Mount Palomar and forming the polar axis of the telescope, parallel to the earth's axis. The frame of the yoke is of hollow steel tubes one inch thick, sixty feet long and ten and one-half feet in diameter, constructed of conventional welded design with one seam.

One end of the frame terminates in a great horseshoe weighing 350,000 pounds, the world's largest bearing journal, as heavy as the biggest locomotive. This horseshoe bearing is of hollow box construction, four feet thick and forty-six feet in diameter. It is made in three sections, bolted together, and the center section, weighing about 120,000 pounds, is the heaviest single piece of the mounting.

This horseshoe is taller than a four-story building and the bearing was designed so the tube might be pointed toward

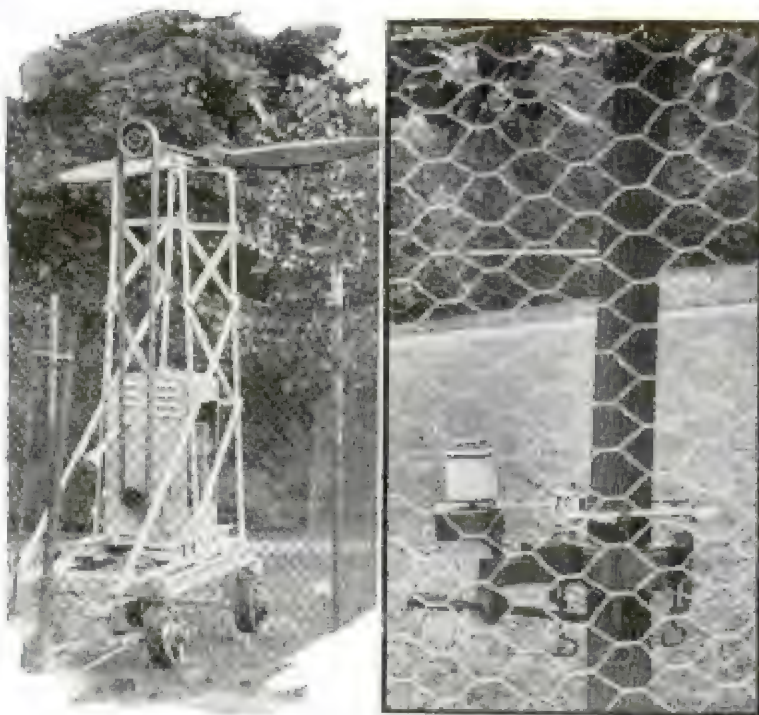


Top, 130 men standing within the ring which is installed at the bottom of telescope tube. Bottom, framework for the giant telescope

the north pole. When so pointed, there is a clearance of only two and one-half inches between the tube and the sides of the horseshoe, which has a throat twenty-two

(Continued to page 133A)

Tree's Temperature Taken to Show If It Is Feverish



Left, propeller circulates air to cool off trees with high temperatures. Right, thermometer for taking trees' temperature

Treatment of trees which get feverish is the object of an experiment being conducted in the Missouri Botanical gardens at St. Louis. The internal temperature of the sick tree is taken with a thermometer, and a chart below the instrument is used for recording variations. An airplane propeller mounted in the gardens circulates the air around the trees to keep them cool when their temperatures rise too high.

Hundred-Mile Rail Speed Easy but Pity the Dispatcher!

Stepping up the top speed of railway trains to 100 and 120 miles an hour with sustained speeds of eighty and ninety miles has been relatively easy, but the railroad man's toughest problem is to coordinate schedules so that the slower trains do not spend too much time on the siding dodging the streamliner. As a result, the slow trains are gradually speeding up, servicing stops are being shortened, and roadbeds are being improved so that trains are as safe at eighty miles an hour as they formerly were at sixty. Another major difficulty is that of stopping the hundred-mile limited. With the best brakes developed, a train traveling at that speed would roll

1,300 feet in the first ten seconds after brakes are applied and would still be going seventy-two miles an hour; it would take another 1,300 feet to stop it. With ordinary train brakes it would take twenty-two seconds to cut the hundred-mile speed down to seventy-two miles an hour and it would require 4,800 feet to stop the train.

Air Conditioner for Auto Fans a Filtered Breeze

You can lower the temperature inside your closed car ten degrees with an air conditioner built by an automobile mechanic. He inclosed a filter, electric fan and tank for cracked ice in a metal cabinet. The filter was a rectangular pad of steel wool impregnated with light oil, framed with screen wire and placed over the air intake in the end of the cabinet. The fan, set vertically, directs air downward and under the tank, which was suspended an inch above the bottom. Vents in the end of the cabinet allow the air to circulate through the car, which must be kept closed. The tank holds twenty-five pounds of ice.



This home-built air conditioner using filter, fan and cracked ice cooled interior of car by ten degrees

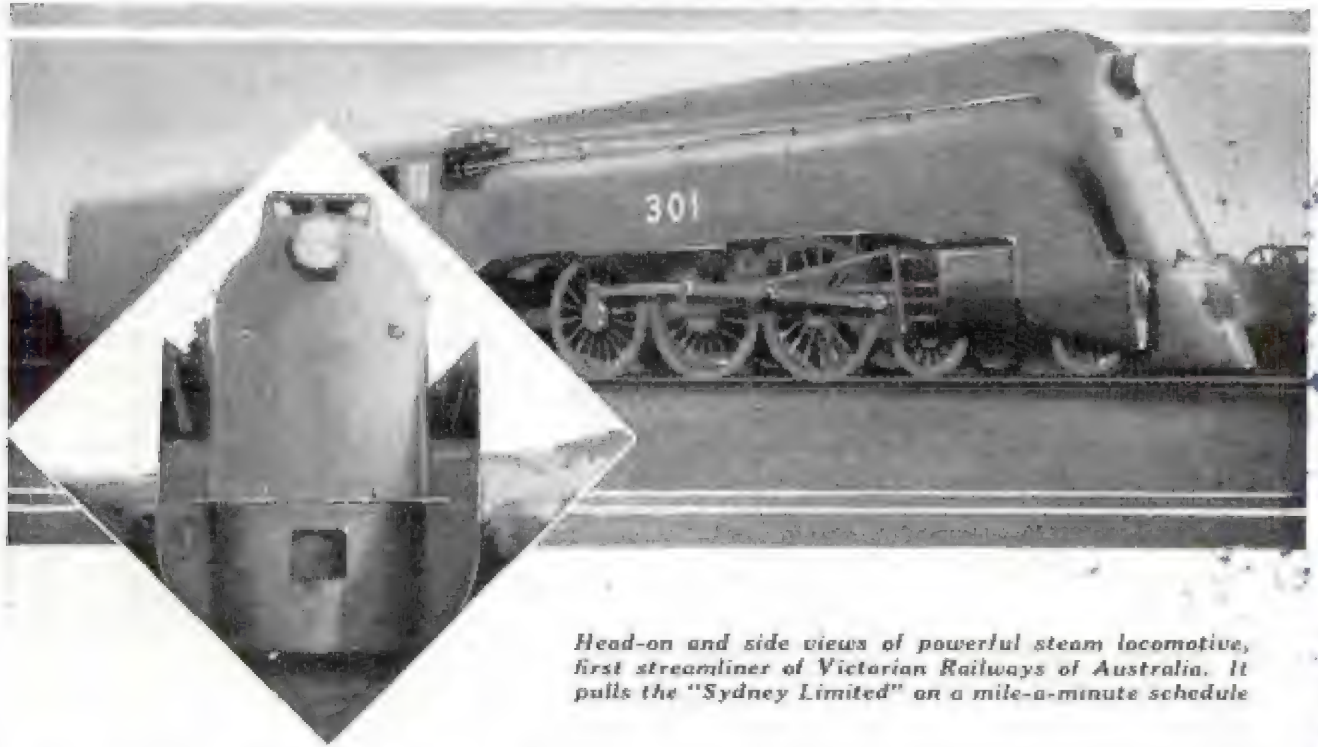
The Valley Electric Co.
P. T. ...

Emd. A. W. Prange 4/15/2
Botanical are ill Louis, Mo

ls 859

Science Service July

Fast Streamliner Hauls Australian "Limited"



Head-on and side views of powerful steam locomotive, first streamliner of Victorian Railways of Australia. It pulls the "Sydney Limited" on a mile-a-minute schedule

First streamline locomotive on the Victorian Railways of Australia is the steam-driven "S 301," built to haul the "Sydney Limited" between Albury and Melbourne. It will cover the 200-mile run in three and one-half hours, fast time for the grades on that route. The engine is a three-cyl-

inder Pacific type developing 2,100 horsepower, its six driving wheels each six feet one inch in diameter. The locomotive itself is thirty-five feet long and its tender, thirty-three and one-half feet long, carries thirteen thousand gallons of water and eight tons of coal.

Radio System Controls Model Plane from the Ground

Enabling the operator to control model planes from the ground, a radio system was demonstrated recently at Detroit. The operator holds a control box in his arms and manipulates push buttons and levers to regulate movements of the model plane as it flies. Many standard maneuvers of large aircraft may be executed with the aid of the radio control.

One electric manufacturing company uses 1,800,000 sapphires every year for main bearings of watt meters.



Ready for the takeoff of the radio-controlled model airplane

Westinghouse

Wade White Owned by Elmer

Rear-Engine German Racer Sets U. S. Record



ture of the speedster, which has four forward speeds in an overdrive transmission which permits free wheeling in the turns and shifting without declutching. The car has four-wheel brakes on wheels which carry 7.00 by 19-inch tires on the rear and 5.50 by 19-inch tires on the front. Two carburetors with vertical superchargers meter fuel to the big racing machine and there are two magnetos. The engine, coupled to rear drive, turns up between 4,000 and 4,500 revolutions per minute. It has 366-cubic-inch displacement.



Here are two views of high-powered German racing car in speed trials. The car established a new record for American speedways

Powered with a sixteen-cylinder rear engine developing about 450 horsepower, a German Union racing car has broken all American track records with a speed of 159.8 miles per hour. The same car, driven by Bernd Rosemeyer, won the George Vanderbilt cup at Roosevelt Raceway on Long Island recently. Unusual flexibility is a fea-

Apple Tree Adopts Thirty-Five-Hour Week under Glass

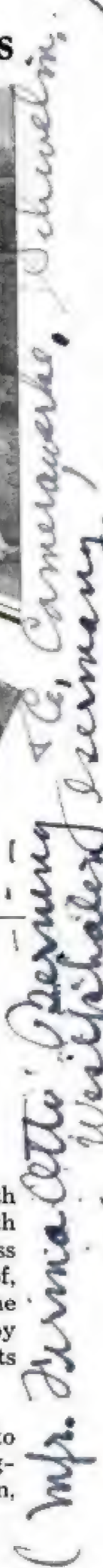


Apple tree "works" under glass as growth is studied

Even the apple tree works under a prescribed routine of thirty-five working hours per week. At the Cornell experiment station at Ithaca, N. Y., an apple tree has been put under glass and is allotted five hours each day for the business of growing leaves and producing fruit. Its growth is under careful control while a study is made of the amount of starch and sugar the tree can synthesize. Ultraviolet rays are almost entirely excluded, with the result that the apples do not have their usual red cheeks.

Names and addresses of manufacturers and dealers in articles described in this magazine will be furnished by our Bureau of Information upon request accompanied by stamped, self-addressed envelope.

10 & 40 H. Rem-umf.
ULAR MECHANICS 5
\$153.00 \$152.00 \$179.00
Wound Once for Fifty Shot
- Robt. C. J.



Top, series of four snapshots taken in quick succession merely by pressing button. Notice sharpness of focus. Below are the shutter mechanism and photographer with finger on button of the camera

Fifty fast pictures at the rate of five or six per second can be taken without re-winding, merely by pressing the button of a miniature camera recently introduced. A powerful clockwork motor sets the shutter and feeds the roll film after each exposure, and its fast action makes possible unusual action sequences. Standard motion-picture film of thirty-five millimeters is used. The shutter is of new design, a slotted disk making the exposure instead of the conventional focal plane shutter, and its range is from one full second to one

five-hundredth second. The focal length of the lens is about one and one-fourth inch. The body of this camera is stainless steel, light but strong and weatherproof, for it cannot rust. The over-all size of the camera is two by four and one-fourth by two and three-fourths inches, and its weight is less than twenty ounces.

¶ Whenever you find that you wish to know more about any article in this magazine, write our Bureau of Information, inclosing return postage.



RUNNING *the* WORLD'S

*San Francisco-Oakland Bridge
is 5,641 ft long
Crossed 1,000 times a day
by 10,000 cars*



Top, San Francisco-Oakland bridge at night. Bottom, guard at bulletproof window of cash room

CCROSSING San Francisco bay last year called for an ocean trip on a slow ferry which battled fog, tides and ship-ping. Today you cross at forty-five miles per hour on a concrete highway hung 250 feet in the air.

On the gigantic new double-decked bay bridge motorists climb and descend steel hills, drive through a tunnel that pierces an island and look down on battleships and liners dwarfed to the size of models. The bridge carries you across four and one-half miles of navigable water and lands you in Oakland in ten minutes. It is two and one-half times longer than the next largest bridge in the world and cost \$77,-200,000 to build but you can drive across it for fifty cents.

One of the achievements of the bridge engineers is that the never-ending streams of traffic, with six lanes for cars on the upper deck and three lanes for trucks on the lower, are able to move continuously

on their way with no traffic snarls and with no signals to hold them back. About 25,000 cars and trucks a day use the bridge and sort themselves out automatically in the systems of distributing roadways at each end. Each month 53,000,000 pounds of freight are carried across the structure. To keep this traffic on the go and to keep the bridge in first-class shape takes a big staff although on your drive across you are apt to see only a motorcycle officer or two and the toll collectors. But behind the scenes there is a large, busy organization. This bridge is so big that it has its own bank and its own jail. It has a hospital, fire department, administration building, seven electrical substations, and even its own publicity department. In all there are about 250 employees working in the different shifts, including bridge inspectors, guards, electricians, painters, toll



GREATEST BRIDGE



Top, underground in San Francisco anchorage of great bridge where cables are anchored in concrete. Bottom, twenty-six foot control board through which current flows for all circuits and lights

Reference - Julie T. 12020
Public Information Officer

San Francisco - Oakland Bay Bridge
5000 San Francisco - Oakland Bay Bridge

10555 Hollywood Blvd
Los Angeles Calif 90024



Top, indicator which shows location of emergency calls on the bridge. Bottom, cutaway reveals secrets of center anchorage

collectors, auditors, garage men, and patrol officers. Running this bridge comes under the heading of big business.

As you drive to the Oakland toll gate your car scratches over a piano wire "cat-whisker" projecting from the pavement and this relieves your car of any static charge, preventing a heavy shock to the collector as you hand him your money. Before the catwhiskers were installed the shocks were so strong that collectors often dropped coins as if they were red hot. Even now they get a tingle occasionally since the rubber insulation on some cars prevents all the static from being dissipated by the catwhisker.

When your toll is rung up on the register it flashes a visual receipt to you on an electrical indicator. At the same time a code number blinks on the roof of the toll station to give the same information to the sergeant on duty behind a window in the administration building. The money turned in by each collector must agree not only with the register record but with a counter buried in the pavement that clicks for every pair of axles that passes over it. From now on the toll money is under heavy guard. Each collector's receipts, in a canvas bag, slides down an armored chute into the cashier's room in the administration building. As much as \$15,000 cash goes through this room every day so the room is protected by steel walls and laminated bulletproof windows and officers are always on guard outside. To get in you are locked through two armored doors and inside there are weapons and a telephone for calling outside help.

Catching automobile thieves at the toll plaza is part of the work of the motorcycle officers and now and then a counterfeiter is nabbed after he has paid his toll with fake money. By telephoning to officers stationed at the far end of the bridge the patrol captain can have any car stopped before it gets away. Officers patrolling the structure are called to their nearest bridge telephones by blue call lights that blink when the captain throws the general alarm switch.

Traffic must be kept moving all the time so it is against the law for you to stop your car or take a walk on the bridge. One dodge used by people who want to stop and admire the view is to pretend to run

Looking toward city of Oakland 21564

from East Portal Yerba Buena Island turned



approach to toll

out of gasoline. To get away with it they go to the nearest of thirty-three emergency call boxes and break a glass dial that signals for a service car. The disadvantage of this is that the service car, equipped for every kind of trouble, arrives within a couple of minutes and then the sight-seers must be on their way again. The minimum charge for gasoline is ninety cents for three gallons. Roadside tire service costs half a dollar and being towed off the bridge costs twice the toll fee paid. Contrary to general belief motorists are not fined or charged excessively when their cars break down. The average charge per breakdown so far has been ninety-one cents, including every kind of service. When a stalled motorist signals for help on the bridge his alarm is registered in the tow-car garage and also at the highway patrol office, where an officer is sent immediately to the call box from which the alarm originated. His job is to direct traffic around the stalled car. After dark he sets out signal flares to prevent accidents.

(Continued to page 122A)



no charges

Bay Bridge



Top, spectacular lighting of the bridge. Center, stranded motorist calls help by breaking glass of dial in red box on bridge. Bottom, toll gates at Oakland end of the great span

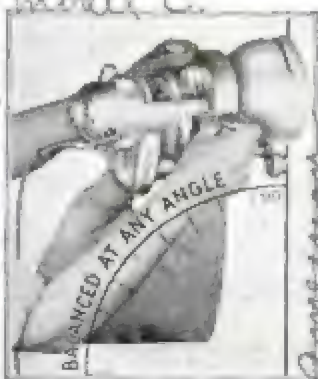
Italy's Fighting Ships Parade to Show Power



Fighting plane roars over Italian fleet as the great warships move out for display of naval power

Disk Sander with Four Handles Is Balanced at Any Angle

Balanced to make work easy at any angle, a disk sanding machine is offered for use on paneled walls, stairs and floors. It has an extra set of handles, placed low at a



point of balance so that its weight is not noticeable. The disk is five and one-half inches in diameter, operating at 2,200 revolutions per minute. A light illuminates the area being sanded.

Demonstrating Italy's sea power, 170 fighting ships paraded off Naples recently in a review staged for the visiting envoy of another European nation. As the battle craft gathered for the martial display, a photographer on one of the destroyers caught an excellent shot of two ships steaming to join the marine parade.

Optical Illusion Slows Cars at Crossing

Unusual control over traffic is attained at one dangerous highway intersection in South Carolina through the use of road signs which create an optical illusion. The signs seem to be closing in on the fast driver as the intersection is approached, causing him to slow down his car to a safe speed. Six feet high and eight feet wide, the signs are painted with alternate black and white horizontal stripes. On each of the four approaches the sign most distant from the intersection is set at right angles sixteen feet from the edge of the highway. Then, one by one, the signs are placed two feet nearer the pavement until the eighth and last one is only two feet off the road. To increase the closing-in effect the distance between the signs is reduced as the crossing is approached. Thus, the distance between the outer barricade and the next one is 200 feet. This distance is reduced twenty-five feet with each succeed-



Road signs which appear to close in on driver as car approaches intersection

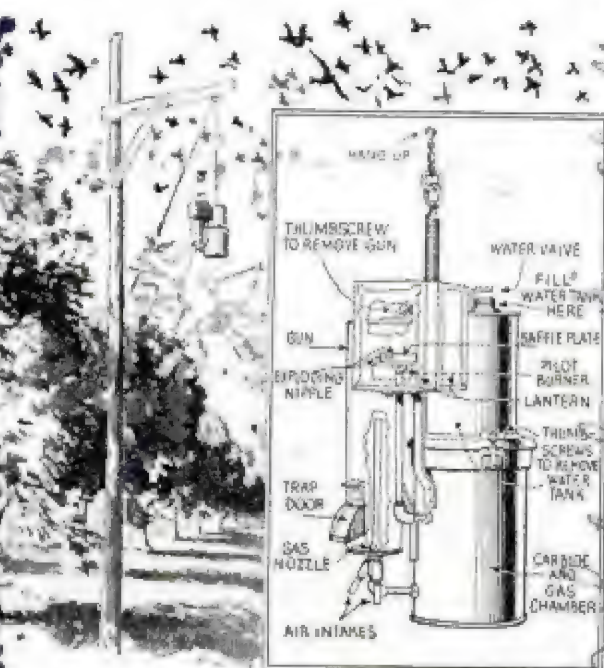
State Highway Dept
Columbia S.C.

American 7 Low Surfacing Machine Co. 508 S. Blair Ave. Toledo Ohio

ing sign until there is a distance of only fifty feet between the seventh and eighth. Used on the two highways where 1,400 vehicles pass between seven in the morning and seven at night, the signs have sharply reduced accidents. Prior to the installation of the signs, other conventional crossing controls had failed to reduce the number of accidents at that point.

Gas Exploder Guards Cherries from Marauding Birds

Recommended as a means of protecting the cherry crop from robins, starlings, crows and other marauding birds, an automatic acetylene exploder is available. It consists of three chambers, one for calcium carbide, another for water and a third for mixing the gas and air. Gas is generated by water dropping on the carbide. A pilot burner sets off the gas when the charge becomes heavy enough and the explosion occurs through a metal trap door. The resulting noise is similar to the sound of a twelve-gauge shotgun. The device may be set to fire four times per minute or once every ten minutes. Suspended from a twenty-five foot pole in the cherry orchard, the exploder swings back and forth at each explosion, frightening away the birds. In tests the gun has reduced the number of birds feeding on the ripening cherries by about ninety per cent.



Sketch of exploder which protects cherries by frightening away the birds

Weight Gauge in Loaded Plane Finds Center of Gravity



Holding the instrument board which shows which part of plane is heaviest

For helping the pilot to determine the center of gravity of his loaded plane, a new device shows whether the ship is "nose heavy," "tail heavy" or "wing heavy." It is the libroscope or visual balance indicator and saves considerable time when used as a substitute for pencil-and-paper figuring.

Generator on Bicycle Wheel Supplies Current for Lights

Current for front and rear lights of a bicycle is supplied by a generator mounted on the front fork and regulated by an automatic governor. This generator, just developed, runs off the side of the front tire and at only one mile an hour it starts current to the lights. At four miles an hour it delivers full voltage, and at higher speeds the current is automatically controlled. A small catch holds the generator out of position for daytime riding.



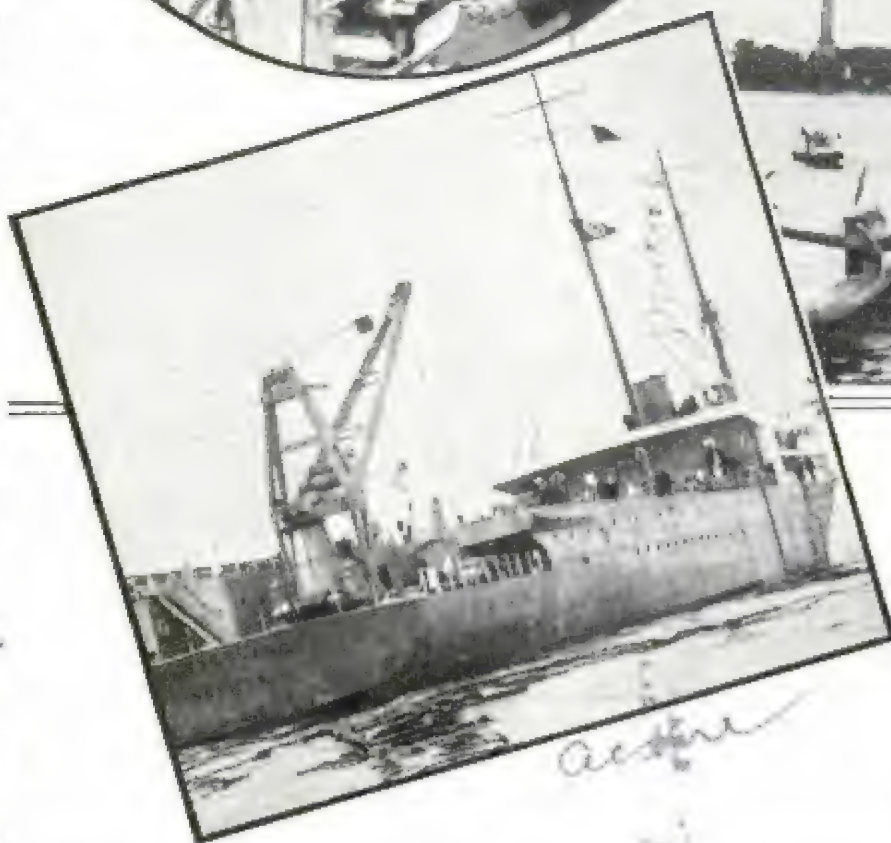
Bullington #160, Michigan State College. Aug. 1928. p. 540

Perfected by Engineer Lewis
see Oct 1928. 544

make a. n. l. e. c. h. e. f. f. e. r. d. a. m. a. s. t. e. r.

make a. l. t. e. c. o.

Trail Blazed for Atlantic Air Lines



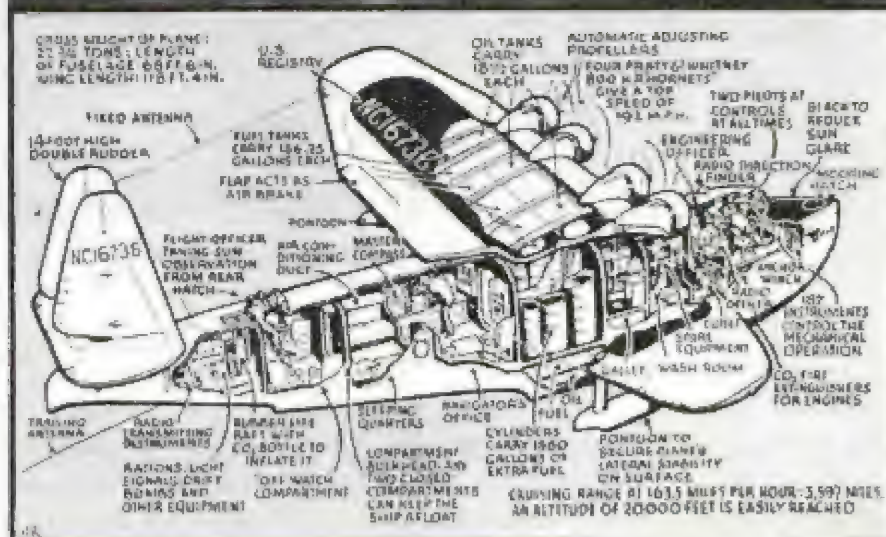
Top, right, crane about to lift plane from water. Circle, crane controls. Bottom, the "Friesland" as it was being tested for use as floating base for transatlantic aircraft

Lufthansa
each flying 7,000 miles. None of the fanfare of previous transatlantic flights marked these tests. Instead, Pan-American's "Clipper III" and Imperial's "Caledonia" quietly

With four nations racing to complete test flights, regular air service between the United States and Europe may be expected within a few months. Just recently two giant flying boats, one operated by Pan-American Airways of the United States and the other by Imperial Airways of Great Britain, conquered the Atlantic in both directions on round-trip surveys,

took off from the terminals of the 1,995-mile water jump between Newfoundland and Ireland, flew a few hours and quietly landed on the other side, all without accident. It was hardly more than a routine trip, the crews said. Under the command of Capt. Harold E. Gray, the "Clipper III" crossed from Botwood, Newfoundland, to Foynes, Ireland, in twelve hours and thir-

ty-nine minutes and from Foynes to Botwood in sixteen hours and twenty-eight minutes. The "Caledonia" made both crossings in slightly less time. Port Washington, N. Y., is the western base of the line and Southampton, England, the eastern. Southampton is the seaplane base for the Port of London. Landing and servicing facilities have been located at Port Washington, Botwood, Foynes and Southampton. Pan-American and Imperial have been cooperating for several months in erecting these ocean-flying service stations and in



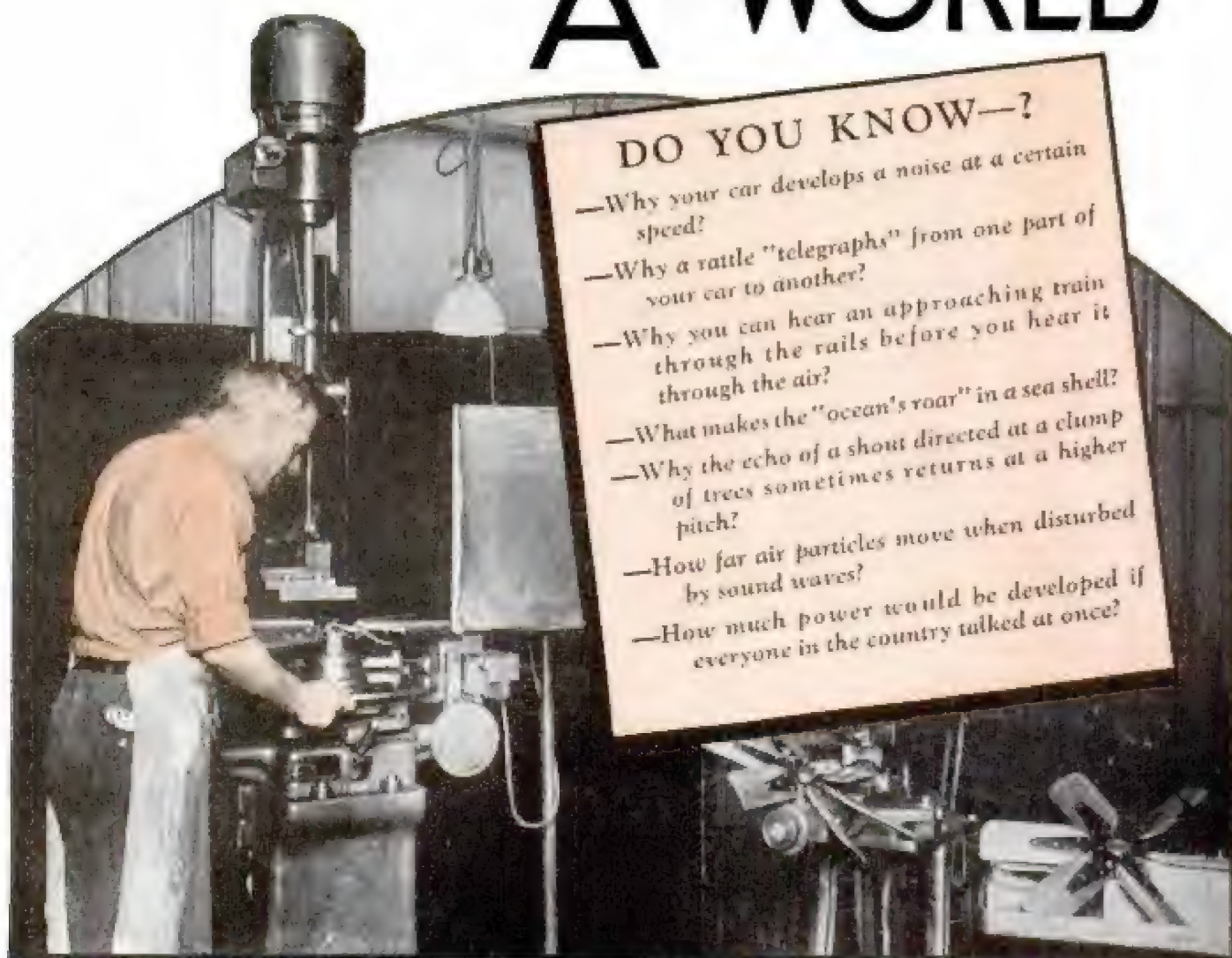
Top, Capt. Gray and First Officer William de Lima at controls of clipper. Center, the clipper about to take off. Bottom, cross-sectional drawing of the big Sikorsky clipper

altitudes of 20,000 feet. Germany and France also are accelerating their preparations to establish air lines to the United States. Lufthansa, German airplane company, is stationing four ships at intervals across the Atlantic to serve as floating

survey flights. During the winter the two companies plan to cross the Atlantic by way of Bermuda and several test trips have been made by both lines. Pan-American's "Clipper III" is propelled by four 800-horsepower engines and its top speed is 192 miles per hour. At a cruising speed of 163 miles per hour, the clipper's fuel supply is sufficient for 3,597 miles. The craft is a 45,500-pound Sikorsky, carries a crew of seven and is equipped with all the latest radio apparatus. It can easily reach

bases for ocean-flying craft. Four-motored aircraft, which are being used in experimental flights, land beside the base ships and are hauled aboard for servicing. A giant crane picks the planes off the water. France is planning a Paris-New York air line which would touch at the Azores, using the southern route. A floating meteorological station is studying weather conditions for Air France Transatlantique, which will use flying boats to transport passengers, mail and express across the ocean.

A WORLD



DO YOU KNOW—?

- Why your car develops a noise at a certain speed?
- Why a rattle "telegraphs" from one part of your car to another?
- Why you can hear an approaching train through the rails before you hear it through the air?
- What makes the "ocean's roar" in a sea shell?
- Why the echo of a shout directed at a clump of trees sometimes returns at a higher pitch?
- How far air particles move when disturbed by sound waves?
- How much power would be developed if everyone in the country talked at once?

Exact balance of cooling fans reduces automobile noise. Here is the machine on which fans used in Packard automobiles are balanced

NOISE is a waste product of the machine age. But today—and here's good news for tired ears—the very civilization responsible for all the unwanted sound which frazzles our nerves is gradually eliminating noise from our daily lives, conquering it so quietly we have scarcely been aware of the conquest.

Thirty years ago an automobile needed neither horns, whistles nor sirens to herald its coming. Its popping exhaust, clanking chain drive and chattering chassis were warnings enough. Today's car purrs along the highway as quietly as a kitten.

Twenty years ago a factory's output could be measured by the volume of racket it created. Today industry no longer roars. It hums.

Ten years ago express trains thundered by with all the rattlings and clankings of

mile-long freights. Today streamliners glide along the rails like phantoms.

Five years ago air lines supplied passengers with wads of cotton to keep some of the bedlam out of tortured ears. Today air passengers converse in ordinary tones in soundproof cabins.

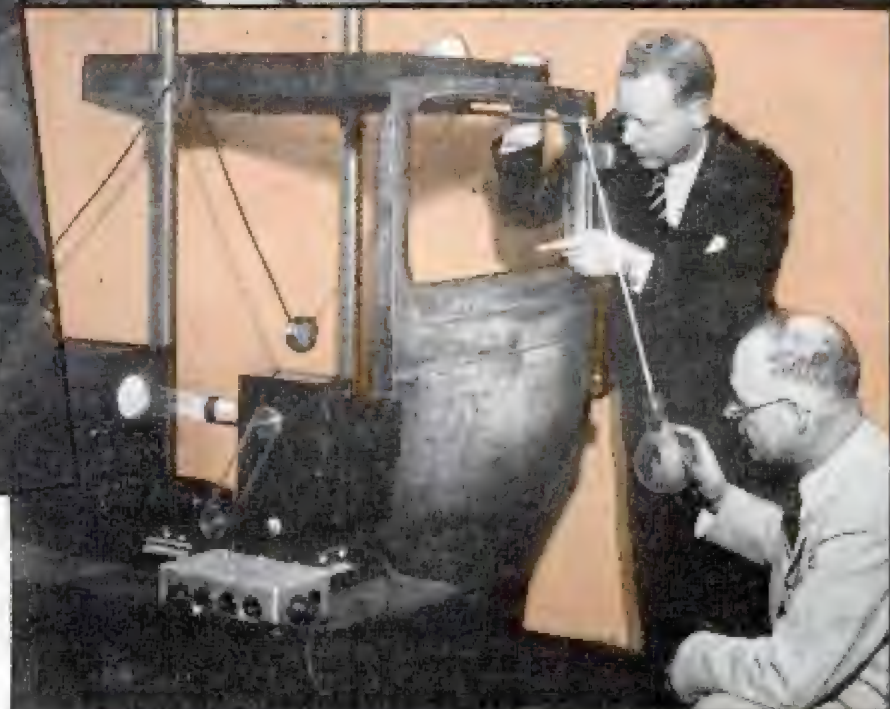
Only yesterday you could recognize the kind of heating equipment your neighbor employed by the distinctive clamor in his basement and the refrigerator he owned by the rumblings from the kitchen. Today you wouldn't know he possessed either if you waited for them to sound off in order to find out.

Thus is this being made a more peaceful world in which to live. And the quiet, soft-spoken men responsible for stilling the roar of traffic, muffling the rumble of industry, quieting the clatter in offices and

EASY *on* YOUR EARS

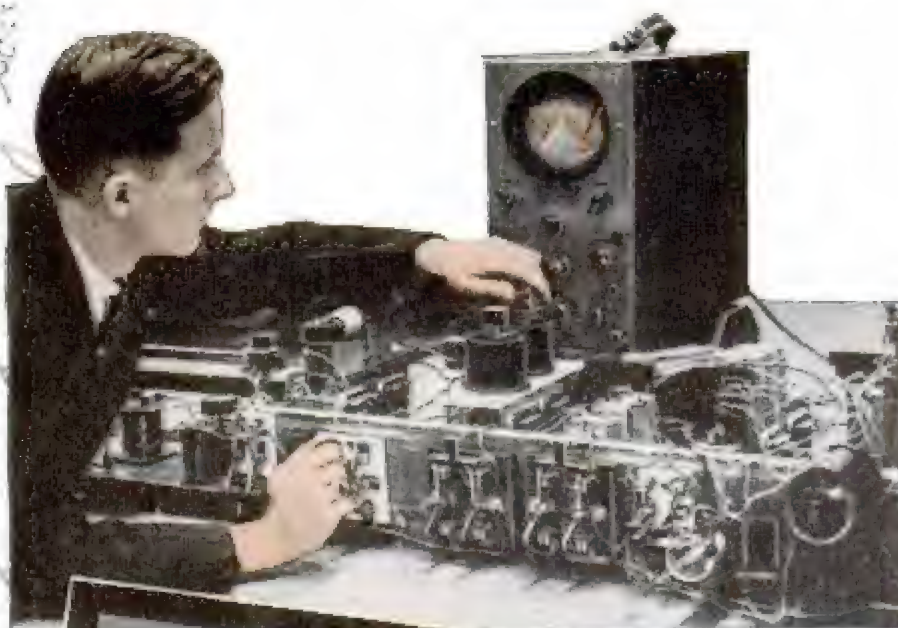
silencing home appliances are the sound engineers, the noise detectives of modern industry. They are not only making this a world easy on the ears, but they are also increasing the efficiency of machines by modifications made in reducing noise.

There is scarcely a field which the silencing hand of the sound engineer has not touched. In industry he has soundproofed heavy factory equipment; in business he has silenced typewriters and computing and billing machines; in transportation he has removed the annoying sounds from trains, airplanes, automobiles, ocean liners, buses and



Top, checking precision of gear-cutting equipment to insure quiet gears. Below, measuring noise inside car body and testing Plymouth door panel for noise vibrations

Es. 57-3
 Arthur Chase, Director, U.S. Dept. of Commerce Engineering Division



Radio "hum neutralizer" which erases one noise by setting up contradictory sound, as indicated in glass finder, below

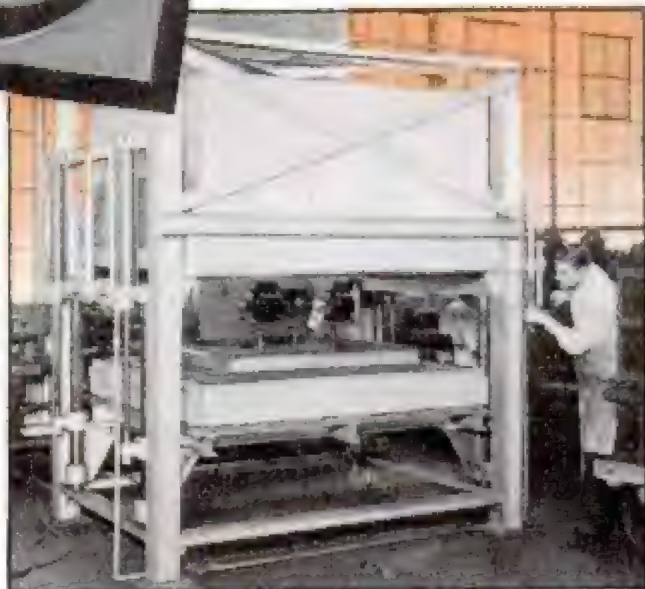
street cars, and in the home he has quieted refrigerators, washing machines, vacuum cleaners, oil burners, fans and even the structure itself.

When man began making machines to do his labor for him, he applied just one test to each—will it work? If a machine could do a particular task better or quicker or cheaper than man could do it by hand, it was a success. True, it might make an infernal racket. In fact, it usually did. But if it worked, the makers didn't worry about the noise.

But they worry today. They worry plenty. For noise, it has been discovered, means waste. It also means lost sales. John Q. Public has decided the "Q" stands for "quiet." If it's noisy, he doesn't want it. So important has become this matter of pleasing the ears that great industries like the General Electric company employ experts to fight noise year in and year out.

These engineers can't wait until a refrigerator is built, then try to eliminate whatever noises it happens to develop. It's their job to eliminate most of the noise when the refrigerator is being designed. This requires a knowledge of how sound is produced and transmitted and an ability to measure it and determine its qualities, not only in air, the usual medium of transmission, but also in solids and liquids.

Just as a trained ear can pick out the instruments in an orchestra, so can the acoustical engineer, with modern sound-measuring and analyzing equipment, pick out the particular parts of a machine that are making noise. Sound is produced



Concrete noise booth with hydraulic movable base for fractional horsepower motor-sound analysis

by vibrations of some sounding body. When these vibrations are transmitted to the ear through the air or some other elastic medium and excite the auditory nerves, we experience sound. So, in measuring sound, the engineer, in effect, measures a human sensation with a machine.

Noise is sound we do not like and the

How Wayne Works

engineer strives to eliminate the annoying sounds, not all sounds. He seeks quiet, not silence. Once he discovers what makes a noise, his fight is more than half won. The exasperating part is tracing a noise to its hiding place. After that, it's a problem of stopping or isolating the vibrations which cause the sound, or if they cannot be controlled, absorbing the sound waves with sound-deadening material.

The development of an "electric ear" or sound-level meter has greatly simplified the work of the noise detective. It consists of a microphone to convert sound energy into electrical energy, an "ear weighting" network to provide a response similar to that of the human ear and an amplifier containing an indicating instrument to measure sound level. The results are given in decibels which are a measure of sound just as degrees



Measuring sound in airplane cabin. Above, applying sound-level meter calibrating unit to microphone and measuring singer's voice with instrument used to measure sound in auto tires

Fahrenheit are a measure of temperature.

The feeblest sound we can hear has a value of about zero decibels, the loudest—without experiencing pain—about 120. The noise in a quiet home may average thirty decibels and in a subway train perhaps ninety. The intensity of the feeblest sound we can hear compares with the loudest about as one second of time compares with a million years! We hear only sounds within certain pitch and intensity limits. The lowest audible pitch is about sixteen vibrations per second, the highest about 16,000, or a range from the lowest note on a pipe organ to one about six octaves above middle C. We are probably fortunate in having our ears thus limited. If we could hear sounds at 25,000 vibrations per second, the noise of a dog walking through grass would be audible.

(Continued to page 147A)

1.200 main st

Farm Crop Alcohol Blended into Auto Fuel



Courtesy The Chemical Foundation of Kansas

Left, examining yeast cultures used at alcohol plant. Right, pouring yeast into the culture tank. Bottom, control room in which manufacturing processes are regulated to produce alcohol for the automotive formula fuel. Efficiency in the plant reduces cost of extracting alcohol from farm crops

Sweet potatoes, corn, wheat, artichokes and other farm crops are being turned into alcohol which is blended with gasoline to form a new automotive fuel. Already this fuel is on the market at more than 250 stations in western states. Customers report marked improvement in mileage, cooler engines, some reduction in carbon formation and increased power under load

after using the fuel, which is designated as Agrol 5, 10 or 15. The highest grade, 15, has an anti-knock rating above that of premium gasolines and has been tested with success in airplanes. Agrol 10 is suitable for use in the highest compression engines now driving automobiles, trucks and buses, and Agrol 5 corresponds to "regular" gasoline. Prices are about the same as for gasoline, with the two higher grades commanding a premium of one to two cents per gallon. The new fuel is made from an alcohol fluid mixed in varying proportions with gasoline. It is composed of seventy-eight per cent of ethyl alcohol, six per cent of other ingredients derived from farm products and sixteen per cent of materials produced from coal. Then the Agrol Fluid is blended with gasoline, Agrol 5 containing from five to seven and one-half per cent of the fluid and Agrol 15 containing twelve and one-half to seventeen and one-half per cent. The ethyl alcohol is obtained from the farm crops at America's first power alcohol plant at Atchison, Kans. This plant was completed and placed in operation on October 1, 1936. Unless more equipment is installed this

plant cannot supply Agrol Fluid for more than 1,000 retail stations. The Atchison plant produces 10,000 gallons of anhydrous ethyl alcohol every twenty-four hours, operating on either grains or sugar sirups. Using grains, such as corn or wheat, the plant requires 4,000 to 5,000 bushels per day. Sixteen to eighteen carloads of tubers, such as sweet potatoes, are needed for one day's operation. The manufacture involves: first, preparation of the raw material, including cleaning, grinding or extracting, cooking and saccharifying; second, fermentation with carefully prepared pure strains of yeast; third, distillation of the alcohol of ninety-five per cent concentration and its dehydration to 99.5 per cent or better; fourth, recovery and dehydration of all the residual feed constituents and other valuable by-products, and, fifth, all the complex denaturing operations required by the government. So efficient is the plant at present that the alcohol can be produced for twenty-two and three-fourths cents per gallon from corn which sells at fifty-six cents per bushel. The average price of corn in Nebraska for the last sixty-five years has been forty-two cents per bushel. As operations continue, it is expected that efficiency will increase, lowering the cost without altering the prices which the plant will be able to pay the farmer for his crops. Sweet potatoes, yielding 300 bushels to the acre and 315 gallons of alcohol, will return a gross value of nearly sixty-nine dollars per acre to the farmer. Girasoles, or Jerusalem artichokes, yield fifteen tons per acre, from which 375 gallons of power alcohol are made, and return the farmer eighty-six dollars. By-product feed produced at the plant from the acre of sweet potatoes amounts to 1,650 pounds and from the artichokes, 2,320 pounds. Operation of the Atchison plant is supervised by the Chemical Foundation of Kansas and reports of progress are submitted to the Farm Chemurgic Council, composed of farm, industrial and scientific leaders whose aim is to advance the industrial use of American farm products through applied science.

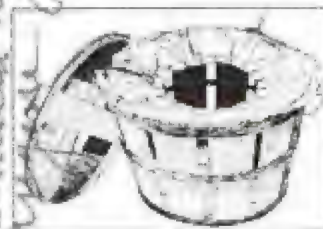
Inter-Office "Bullet-Phone" Offers Two-Way Service



Two-way conversation is possible with this small, attractive inter-office phone for executives' desks

Providing a convenient means of inter-office communication, a "bullet-phone" now on the market offers two-way service over the same instrument, serving both as receiver and as speaker. It is compact, taking up less space on the executive's desk than a telephone. The phone is housed in molded Bakelite.

"Air-Conditioned" Peach Basket Keeps Fruit Cool in Shipping



Fruit can be shipped in "air-conditioned" comfort in a ventilated basket developed by a government agricultural specialist. It is slatted

and has a crown-shaped lid of open construction to let air pass through. Between lid and fruit is a ring-type ventilated pad with a circular hole at the center and a slotted paper liner. Proof of its cooling ability was obtained in a test of a car of peaches loaded at an average temperature of eighty-three degrees Fahrenheit. Peaches in standard baskets cooled to 72.4 degrees while those in the ventilated baskets cooled to 54.5 degrees.

not patented. Designed by S. H. Mallory

Camels Lowered from Ship to Dock Like Freight Boxes



Camel is shown here being unloaded rather unceremoniously from deck of ship by means of sling

Handled almost like freight boxes, forty-two camels recently were unloaded by sling from a ship arriving at Naples. Ropes under front and rear legs supported the camel on the unceremonious descent from deck to dock. The camels were used in a review staged in Rome recently on the anniversary of the proclamation of the Italian empire.

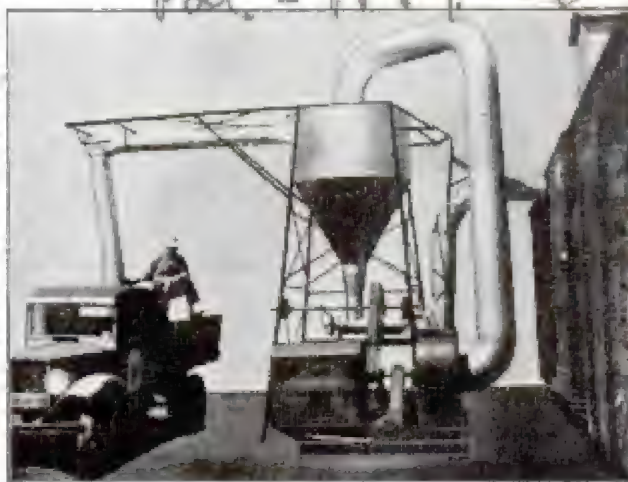
Textiles Made of "China Grass" May Reduce Clothing Costs

"China grass," woven into textiles by the ancient Egyptians but neglected since the mechanical age because it defied mechanical treatment, has at last been tamed. Within a year it is predicted a new industry will arise bringing less expensive

clothes that will wear better and last longer, for the fiber of this plant has a tensile strength almost eight times that of cotton. Ramie, called "China grass" because it grows abundantly in the orient, until now has not been worked commercially because of its tough, viscous gum. Recently, however, the gum has been removed by chemical and mechanical treatment, first cutting the fibers into short lengths. Ramie is easily grown in the Gulf states.

Air Blower Loads Grain from Truck to Train

Fifty thousand pounds of grain per hour can be loaded direct from farmer's truck to freight car by an air blower just developed. It requires no skilled attention. The portable motor and blower is simply set up at the trackside, the intake pipe lowered to the truckload of grain and the engine started. The grain is sucked up by the strong air stream and blown into the car, filling it to the roof and leaving no waste in the truck or on the ground. The grain does not pass through the fan and is not damaged. With a twin-spout model, the same machine can load two cars with different commodities at the same time. The cost of loading wheat in a test was one-fifth cent per bushel.



Automobile or electric motor can furnish power for this blower loading grain from truck to freight car

Children Make Parachute Jump from Tower

In a children's park at Moscow is a parachute tower from which the youngsters make parachute jumps. They start the jump from a short slide and then drift easily to the ground, about twelve feet. The landing is gentle, and this feature of the park has become extremely popular.

Ice Coating Saves Fruit from Being Frozen

Ice has been found a protection for growing fruit when temperatures are below freezing point. Last January when the mercury dropped to seventeen degrees, one California citrus grower started his overhead sprinklers in a ten-acre grove. Next morning the water had turned to ice, covering oranges and leaves on the trees. Many observers predicted that the fruit would be ruined, but the grower argued that the ice, which forms at thirty-two degrees, would protect the oranges, which must be colder than that before freezing. At harvest time the ten acres yielded 836 boxes of oranges and not one orange was found with frost damage serious enough for it to be discarded. Other groves in the vicinity, which had been given the usual protection of smudge pots, suffered so much damage the fruit was not picked.



One of the most popular features of a park for children in Moscow is this parachute jump with a short slide for the takeoff

Screwdriver with Grip Point Holds Fast in Slot of Screw

With a screwdriver that takes the screw "in its teeth" and holds it fast, you can apply screws with one hand in places that

formerly were inaccessible. This tool has a grip point. Insert the blade into the slot of the screw and then throw a small lever; this ejects and revolves the grip point which holds the screw in the slot. The screw cannot be dropped, and you need not guide it with the other hand.



Turning small knob near handle ejects and revolves small grip from notch in blade to hold screw tight

☞Inquiries as to makers or articles described in Popular Mechanics will be answered by our Bureau of Information upon receipt of return postage.

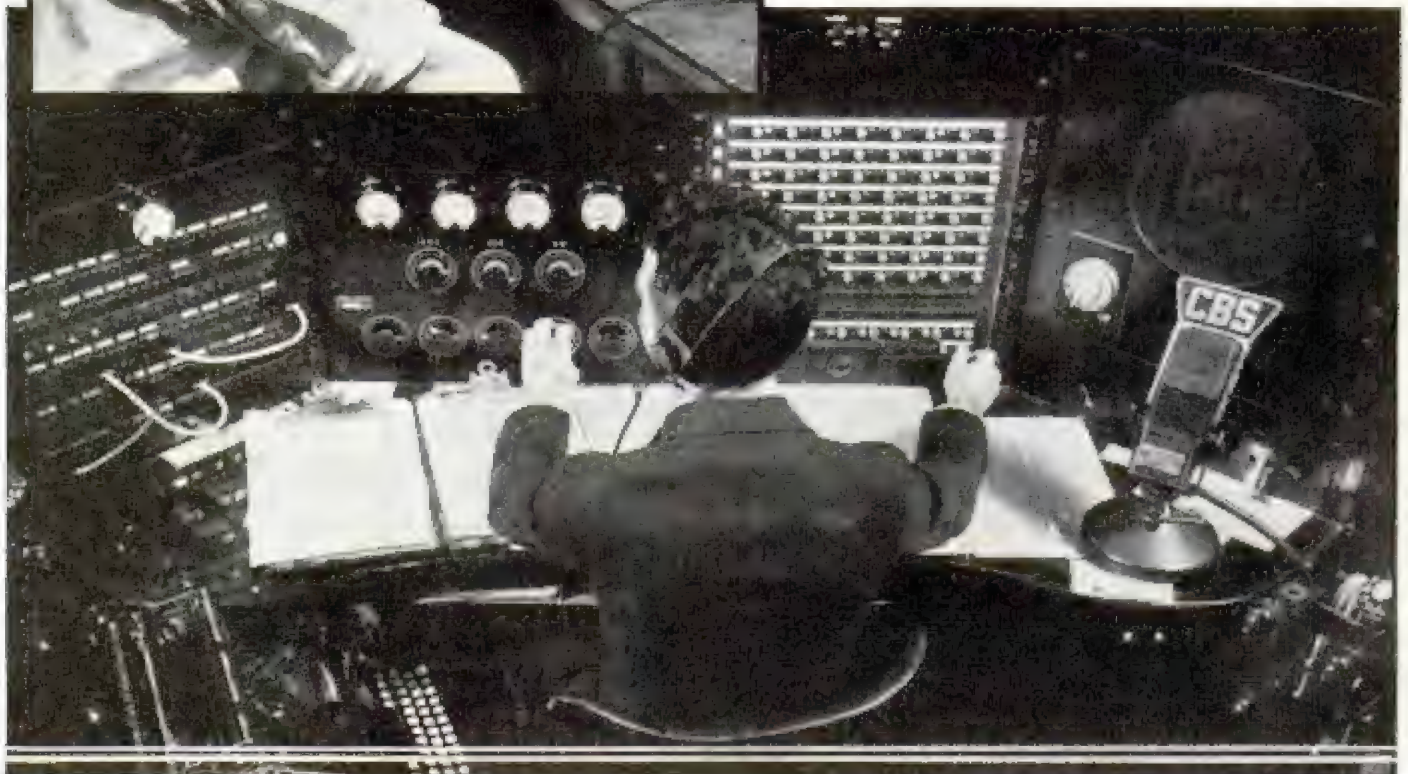
The MASTER MINDS



THE key men of radio are not those who supply the words and music—the singers, musicians, actors, commentators and announcers. Not one of them could be heard further than he could shout were it not for the engineers who hurl the sound to you through space. The engineers are the real miracle men.

And the master mind among the six highly specialized groups in the family of engineers is the M.C.—master control operator—a fast-thinking, quick-acting chap whose day is just one crisis after another and who holds the fate of half a dozen programs at his fingertips although he rarely ever sees a broadcast.

The master control operators of great networks like the Columbia Broadcasting System and NBC are radio's "split-second men" for it's their job to coordinate the ac-



Photographs courtesy Columbia Broadcasting System

From this console in the CBS master control room in Chicago, engineers monitor thousands of miles of telephone lines feeding chain programs to network stations. Above, engineer and announcer with short-wave receivers picking up short-wave relay from plane

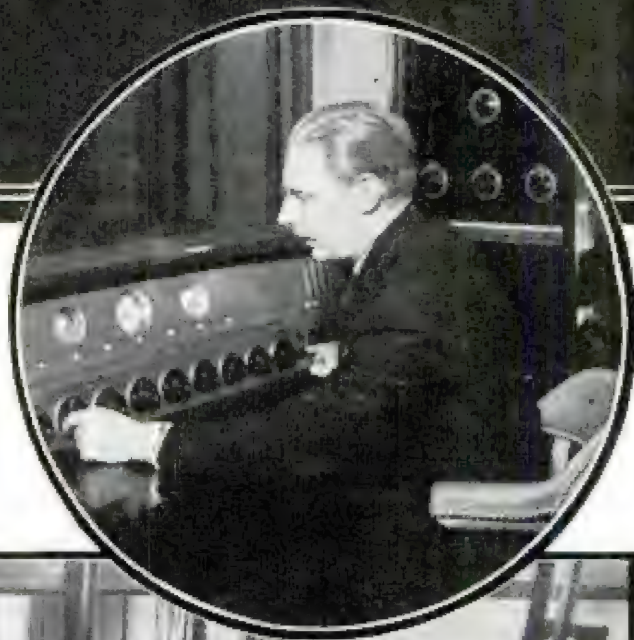
of RADIO



tivities of dozens of stations, to prevent and correct operating mistakes with lightning decisions and to dovetail two or three groups of stations when the timing goes completely "haywire" as it sometimes does when a big news story breaks and programs are interrupted by news bulletins.

If you get jittery when telephones jangle and typewriters rattle, you wouldn't make a good M.C. A man of iron nerves and cool head, the M.C. sits at the master control board in a room about the size of an average office. In his ears blare four or five programs from as many loudspeakers. At his elbows six or eight tinkling telephones constantly bring messages from near-by studios and remote broadcast points like hotels, cafes and ball parks.

At his fingertips are buttons controlling network telephone lines ranging out to groups of affiliated stations. Because some commercial



Top, operator in control booth at WBBM air theater in Chicago. Center, engineer at a typical studio control console. Bottom, looking over shoulder of studio operator as he controls a complex radio production



Above, maintenance engineers overhauling equipment. Right, when spare batteries went dead, these battery-operated trucks furnished emergency power for WBBM in Chicago. Below, radio car plotting station's signal strength



broadcasts utilize only part of the stations of a network, "sustaining" or fill-in programs must be transmitted to the others. Frequently, at Columbia, while one program from Chicago is being sent east to New York and cities in between, sustaining programs are going out from New York, from Chicago and from Hollywood. All must begin and end simultaneously—to the split second—or the M.C. is in hot water when a later coast-to-coast program starts because sponsors register loud howls of protest when stations come on late for their programs.

So the M.C. must see that every program is timed to the second. He gets his real test when big news breaks. Then bulletins pour in and timing goes to pieces. With three or four broadcasts in progress over as many networks and as many more scheduled to follow, the harried M.C. must juggle and jockey his time in frantic long-distance calls to other control points, expanding or condensing individual broadcasts to bring them all back into synchro-

nized timing for the next period. Day and night, the M.C. fights the clock. Each fifteen minutes, one, two or three programs are scheduled to begin in various parts of the country. And a dozen things may happen to keep them from starting. An artist may be late. A battery may go dead or a tube may burn out. And once a studio engineer actually dropped dead at the controls. Whatever the cause, the M.C. has no warning until the failure actually occurs. Then things happen!

Signal warnings flash, phone bells clamor, producers rave. But the M.C. coolly

*Louis Mc.C. Young
Assistant Chief Engineer*

in front of Wrigley Bldg

substitutes a stand-by organ program, issues instructions to studio and remote engineers, receives calls from those trying to locate the trouble and jots down a few notes on his running log. And so it goes, day after day and night after night, emergency after emergency, each handled in his stride by the master control man. And so well do these engineers function that last year the WBBM master control men in Chicago, handling more of Columbia's switching than any other station,



Top, broadcasting political convention. Center, describing parade of fleet from deck of battleship. Bottom, control room set up to broadcast arrival of fleet

went for seven months without one failure or mistake due to the human element.

Working under such conditions, the M.C. develops resourcefulness. Charlie Warriner, WBBM master control operator, and another engineer went to McCook, Nebr., on a vacation in 1935 just in time to land in the middle of a flood which isolated the city, disrupted telephone and telegraph communications and put the town's electric plant out of commission. Working all night, the two engineers rewired an amateur station to operate on low power, then canvassed the town for automobile batteries until they got enough to supply the power to operate the set. For forty-eight hours they manned the receiver and transmitter, contacting relief agencies, ordering supplies and sending out news reports. So well did they do the job that the mayor, when asked for relief information, only chuckled and answered, "Ask Warriner, he's running the

(Continued to page 118A)

Old Iron Horse Shows Speed Hitched to a New Streamliner



The kitchen being in an adjoining car, this full-length diner is unusually spacious. It has round tables instead of the conventional type.

Hauled by the old familiar "iron horse," a new streamliner is streaking between Chicago and San Francisco at a pace twelve hours faster than ordinary passenger trains. Standard trains run on sixty-one hour schedules. The new steam-driven "Forty-Niner" makes the eastbound run in forty-nine hours, while Diesel-electric streamliners still set the pace over the same route in less than forty hours. One feature of this latest streamliner, operated by the Chicago and North-Western, Union Pacific and Southern Pacific lines, is a full-length dining car furnished with round tables. The kitchen is in an adjoining car. The last two cars are articulated, the forward car having upstairs and downstairs bedrooms and the rear containing observation lounge, buffet and rooms. The

outside finish is polychromatic gray. The train, like the Diesel-electric "City of San Francisco," is scheduled to make five "sailings" monthly in each direction.

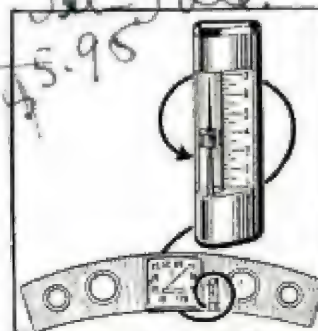
Rubber Cements Used Without Vulcanizing

Four new rubber cements have been introduced for application without vulcanizing wherever two materials are to be bonded together for use under a wide range of temperature fluctuations. The cements may be used to bond together materials such as rubber, glass, metal, tile, fabric, wood, leather, paper and burlap. There are two types, black and clear. Each type includes one permanently tacky adhesive and one that does not remain tacky after drying. The resistance to deterioration through exposure is claimed to be excellent.

The adhesives can be formulated for fast or slow drying and for different methods of application.

Fuel Gauge for Car Shows Rate of Gasoline Consumption

Gasoline waste is brought sharply to the motorist's attention by a fuel consumption gauge which can be installed on the instrument board in a few minutes. Linked by tubing to the gas line of the car, it shows the rate of gasoline flow through the carburetor. The driver watches an indi-



Pandura Products Co.
612 N. Michigan Chicago

Charles E. Johnson, Tulsa, Okla.
cator rise as he steps on the accelerator and can observe the high consumption of gasoline while using the choke. It helps to show the most economical speed range of the automobile.

Large Single-Wheel Skates Strengthen Skiing Muscles



Trying out the one-wheel skates which are intended to strengthen the same muscles most used in skiing

Table-Top Electric Oven Bakes in Half Time

In a small electric oven that rests on an eight-inch pedestal on the kitchen or dining-room table a housewife can bake her cake and pie in less than half the time required by an ordinary stove. This oven, looking more like a large chafing dish or waffle iron, was invented by an Oklahoma housewife. There are heating elements in top and bottom, which are twelve and one-half inches wide. The food to be cooked is set on the lower element, a three-inch high "collar" of metal is placed around it, and the lid is lowered. It takes fifteen minutes to heat the cooker, then the current is turned off and the food placed in it for baking. A cake that ordinarily requires a half hour baking is done in five to seven minutes; a pie is baked in eighteen minutes, angel-food cake in thirty minutes instead of the usual hour, and an entire dinner can be cooked in an hour.



With heating element above and below and metal collar around it, pie bakes quickly and perfectly

All of the muscles of the legs and back used in skiing are brought into play by large single-wheel skates invented in Austria. Each skate has a brace which is strapped securely below the knee. Fair speed can be attained on the wheels after the user becomes accustomed to them.

Coin Wrapping Made Easy by Packing Funnel

Putting coins into wrappers is made easy by a device called Packoin. As fast as the coins can be pulled off the edge of a counter into the packing funnel they fill the wrappers. The funnel is made of Bakelite, as also is the base on which rests the end of the wrapper. The device is handy for banks and business houses.



Mr. Albert Wagner
Chicago - 310 Jackson

Dummies Dangling on 'Chutes Thrill Spectators at Air Show



Legs dangling from the bomb compartment of plane belong to dummy figures which were released for parachute jumps

Dummy figures were used in a recent air show in England to thrill spectators by making spectacular parachute jumps. The dummies were attached to big bombing planes, with feet dangling from the bomb compartment. High in the air the figures, with parachutes attached, were released to float slowly downward.

Odd Rig Mines Gold in Water of Alaska's Bering Sea

Mining gold in the shore waters of Alaska's Bering sea is accomplished through the use of an odd rig. It consists of a 100-foot mast on shore, a one and one-half-yard slack line scraper and a line for hauling the scraper along the sea's floor and onto the shore. A power plant operates the scraper, bringing it to the mast, where its load of sand and gravel is dumped, then returning it to the water. High percentage of gold recovery has rewarded the company doing the work. The rigging on the

sea side is anchored by eighty tons of rock dropped through the ice when mining operations were begun before the spring thaw. A pool for mining was created off shore by thawing the ice in large pieces with steam and raising each piece onto the ice behind it. In time the pile of ice became so heavy that it broke through the six feet of ice covering the surface, causing the whole mass to sink to the bottom. Within a short time the water was sufficiently clear to permit operation of the scraper. The work is being done at the mouth of Daniels Creek which was the scene of a gold rush in 1900.

Balance Rack for Dancer Teaches Symmetry

Designed to point out twenty directions, an odd frame for instructing dancers is being used in Paris. The pupil stands inside the frame, then extends arms and legs in any of the many directions indicated by the framework. Thus the dancer may learn balance for any position in dance routine.



Dancer demonstrating odd frame designed to teach symmetry of motion

One-Man Folding Saw Cuts Trees and Logs

One man handling a spring-jawed folding saw can cut down big trees or saw a fallen log on the ground without aid. The spring takes the place of a partner at the other end of the saw. The saw blade and a lower arm form jaws held together by a strong spring which applies pressure when sawing a tree or log. The handle is as long as the blade, making it easy to reach up to cut branches from a tree; folded, it is easily carried over the shoulder.

Saw is easily carried over shoulder when folded. Springs hold jaws together to furnish pressure at difficult angles.



Glass Candles Made in Colors Use Wick and Special Fuel

Manufactured in several colors with a heavy deposit of silver on the inner sur-

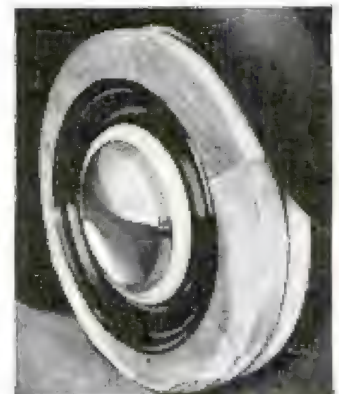


Left, glass candle. Right, candle with outside shell removed for filling with fuel.

face, glass candles are on the market. The candles have an outer shell which is removed for insertion of the inner glass container into the candlestick. Then a wick and a special fuel are placed in the inner glass and the outer shell is slipped over the fuel container until the wick shows at the top. The inner glass holds sufficient fuel to keep the candle burning two hours.

Wooden Tires Put on New Cars for Overseas Shipment

American-made automobiles are being shipped to foreign countries with wooden, instead of rubber, tires on the wheels. The wooden tires permit moving without danger of damaging the wheels, running boards and chassis. Upon arrival overseas, the cars are equipped with regulation rubber tires.



*George C. Guley,
44 N. La Salle*

*Pontiac Motor Co.
Pontiac, Mich.*



SOLVING

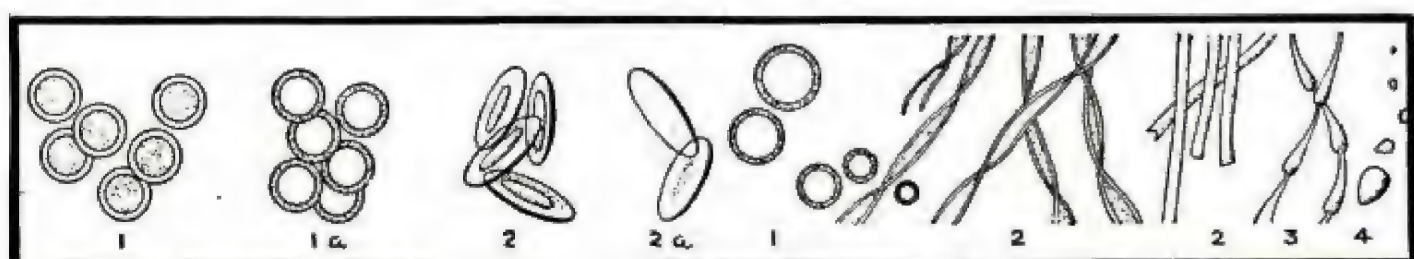
described a man to whom he had given some empty cigar boxes, and others remembered seeing such a man mailing several packages. A colliery employe who fitted the description was arrested but protested his innocence even after a search of his home revealed bits of wood similar to that used in making the partitions, some glue, brown wrapping paper, dynamite like that used in the bombs and nails resembling those used in fastening the boxes.

All of this proved nothing. Then a metallurgist examined the nails. He found they were "reclaimed" and some appeared corroded from mine water. Examining the suspect's shoes he discovered one pair had

By Everett W. Melson

A PENNSYLVANIA man and his young son were killed last year by a bomb sent through the mails. Six additional bombs mailed to others in the same community on the same day were intercepted before they exploded.

The intercepted bombs, wrapped in brown paper, were in cigar boxes divided into compartments by pieces of wood glued in place, and small nails held down the covers. Fragments of the exploded bomb included a piece of a cigar box and a scrap of paper on which were penciled letters and figures in handwriting similar to that



Photographs courtesy Bausch and Lomb
Top, examining questioned document by ultraviolet light. Below, left, blood corpuscles of mammals and ovipara compared. Right, air bubbles, cotton fibers, feather and oil globules

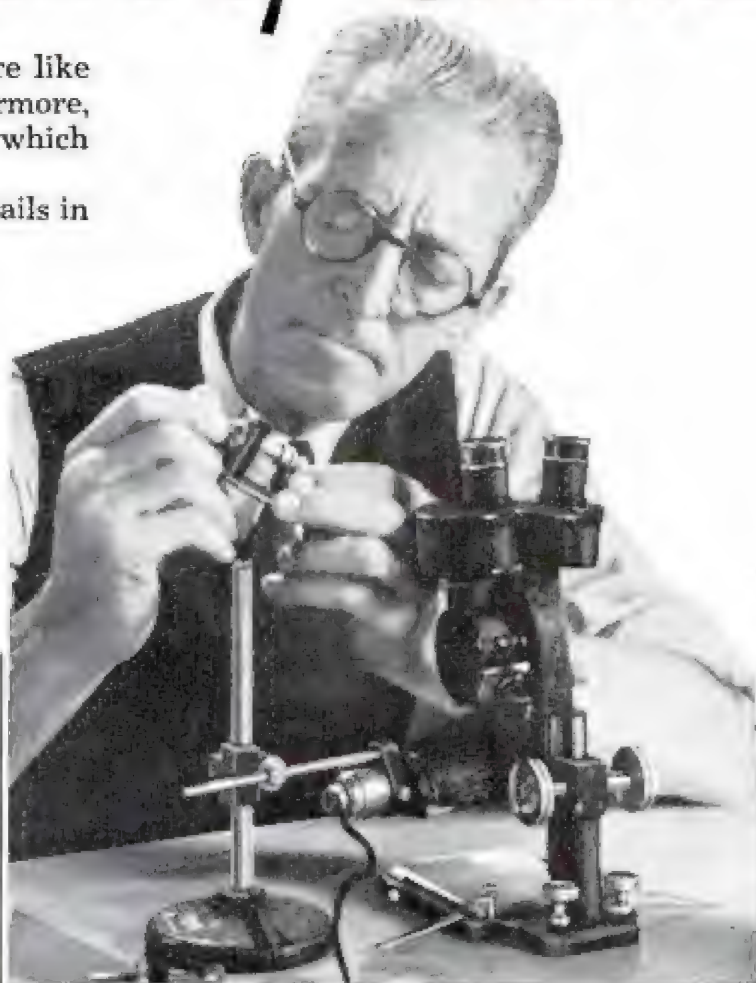
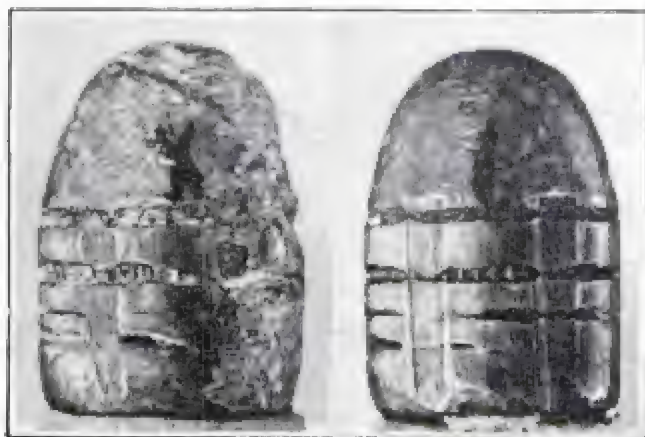
Is 479
Bausch and Lomb Optical Co.
626 St Paul
Rochester, ny



the RIDDLES of CRIME

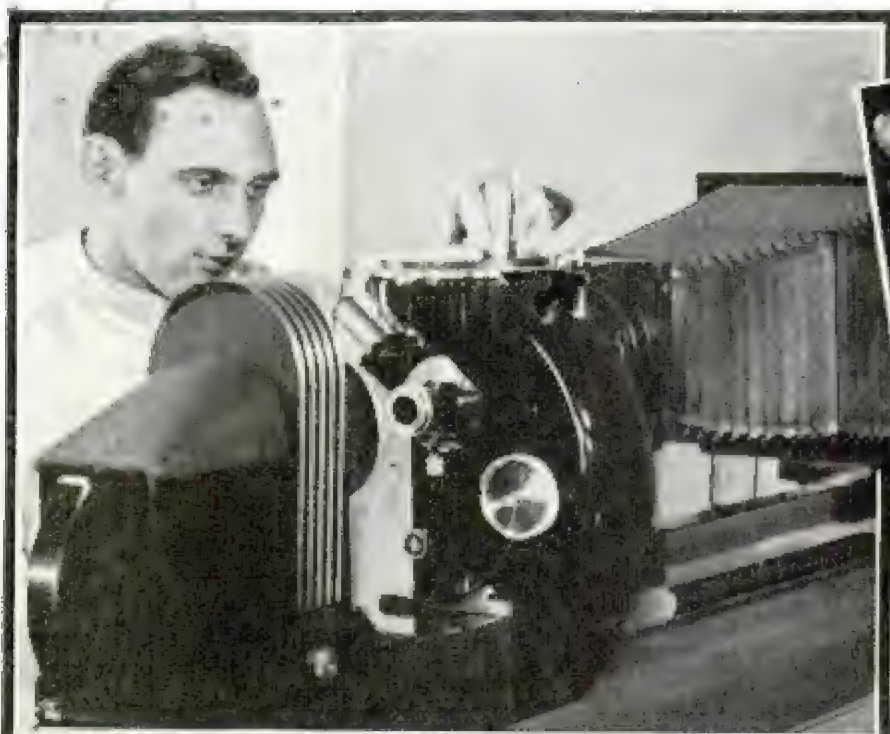
been resoled and the nails used were like those in the bomb boxes. Furthermore, holes were found in the soles from which some nails had been removed.

Then the metallurgist traced the nails in the bomb boxes direct to the suspect! In making nails, a die grips the wire while the head is flattened. This die makes minute marks in the nail and since no two dies are exactly alike or wear exactly alike, a die mark identifies a nail like a fingerprint. From thousands of tests, the expert had learned to gauge die wear by examining such marks, enabling him

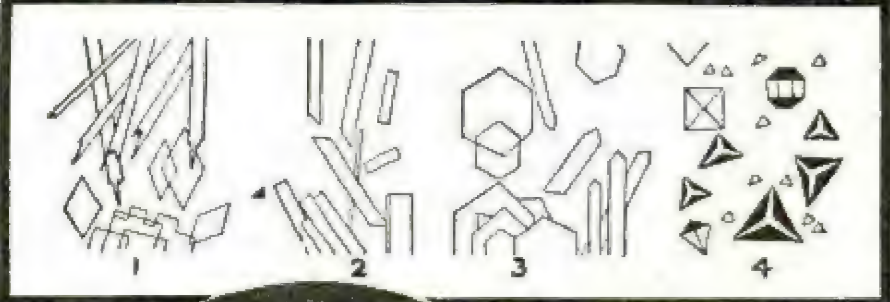


Top, group of ballistics experts. Below, examining bullet and comparison of fatal and test bullet

Edward Ellis.



Magnified photo of small nails which helped convict man of murder and metallographic equipment used in studying crystal structure of metals



Photomicrograph showing similarity of firing pin marks on test bullet and fatal bullet. Above, hemoglobin crystals in blood help to differentiate between man and animals

to determine whether the nails had been made on the same machine and at about the same time. He found four from the bomb boxes and two from the shoes were part of only twenty pounds of identical nails ever made. There were about 40,000

nails in the lot—40,000 nails out of 10,000,000 kegs of wire nails turned out. The chance of two of these identical nails being brought together from widely separated points

was one in trillions! When the man was tried, enlarged photographs of the nails were placed under a stereoscope where the jury obtained a three-dimensional view of their similarities. This evidence, with the testimony of wood experts and others, led to a conviction.

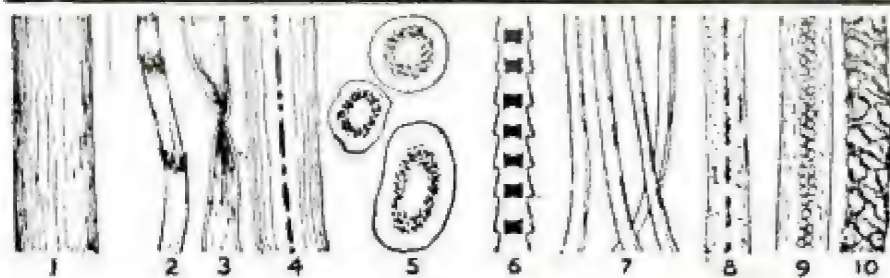
This illustrates how scientific and industrial knowledge help to solve crime. Instruments usually associated with the laboratories of the chemist, biologist, pathologist and metallurgist are being applied to the field of criminal investigation with amazing results.

The scientific criminologist usually deals with evidence so small the eye cannot see it, so his most important tool is the microscope. The most common use of magnification in criminal investigation is in studying fingerprints but a simple hand magnifier usually suffices for this. When he gets down to the really little things of life—and the tiniest bit of evidence often solves a crime—the investigator relies on the compound microscope giving enlargements from twenty-five to 2,000 diameters and up.

Two adaptations of the compound microscope designed particularly for criminological work are the bullet comparison and Osborn comparison microscopes, both developed in the scientific bureau of the Bausch and Lomb Optical company at Rochester, N. Y. One instrument identifies weapons by bullet tracings and the other helps detect altered documents. The wide-field binocular microscope also is used in studying bullets. It allows both eyes to be used at once, affording stereoscopic vision, and the image appears in relief, showing tiny hills and valleys on a bullet caused by the rifling in the barrel of a weapon. The bullet comparison microscope, however, enables an observer to determine points of similarity or dissimilarity between two bullets or other objects appearing simultaneously in a field of vision.

The particular marks made by each type of weapon have been catalogued so ballistics experts can tell the make of

(Continued to page 114A)



Top, comparing shoe with footprint obtained by moulage. Center, how fibers and human and animal hairs differ under microscope. Below, orthostereo camera and fingerprints on bottle. Left, fingerprint magnified

Bausch and Lomb Optical

Inflated Chair Offers Comfort in Air Liner



Top, rubberized fabric chair after inflation, showing how it offers comfort for the air passenger. Bottom, after deflation, the chair may be folded to make this small bundle for carrying. Circle, starting to inflate the chair. Tire pump or carbon dioxide cartridge may be used

Designed to increase passenger comfort and safety, a "balloon chair" has been developed for use in air liners. It also is intended for transport and bombing planes of the U. S. army's air force. The chair is an unbraced rubberized fabric which becomes a comfortable, high-backed chair when inflated with ordinary tire pump or carbon-dioxide cartridge. Deflated, it fits into a small duffle bag. The chair may be covered with velour, mohair or chintz. In the event of a rough landing, it will prevent injury to passengers caused by contact with hard-back seats now in use. Should the air liner land in water, three of the chairs would possess sufficient buoyancy to keep the plane afloat. Weight, always a factor in airplane operation, also would be reduced, since all the balloon chairs which could be used in the largest air liner would weigh only a little more than 100 pounds. The chair can be manufactured inexpensively and is said to have a life of about three years with ordinary use.

Simple Test Finds Most Efficient Combustion Chamber

Automotive engineers have an ingenious method of determining in advance the one design of combustion chamber that will produce maximum smoothness with the maximum output from any given engine. The method is somewhat like that employed by the second of two schoolboys assigned the task of determining the number of cubic inches of space in an odd-shaped vase. The first boy took numerous

measurements, drew a cross-section of the vase, divided the cross-section into many thin layers composed of squares and triangles, figured the cubic contents of each layer and added them up, getting an answer only one per cent wrong in a time of about four and one-half hours. The second boy weighed the vase, filled it with water and weighed it again, then divided the difference (weight of the water) by

.036 (weight of one cubic inch of water) and obtained an answer exactly right. The time required was only six minutes. This procedure is followed by Chevrolet engineers using a new machine developed to perform the delicate operations required on solid plaster casts of combustion chambers. Since flame travels in a constantly enlarging sphere, with its center at the spark plug, the tool was designed to remove successive spherical cuts from the plaster cast, the face of the tool constantly becoming larger just as does the flame front in a running engine. By measuring the volume of the remaining part of the plaster cast it is easy to determine the volume already removed, representing the volume of gas burned when the flame has traveled a corresponding distance. These facts give the engineers the data required in determining the factors needed to provide for a proper burning of fuel. The efficiency of an engine, experts point out, depends on what happens inside the combustion chamber and progress toward the ideal engine can be made only by learning to control combustion. Controlling the variation in shape of the combustion chamber enables the engineers to control combustion.

Nose Clip Guards Swimmers Against Infection



Protection of the nose passages from infection is afforded by a nose clip for swimmers. Clamped on the nose and kept in place by an elastic band around the head, it prevents water from entering the nose.

Hotel Shaped Like Big Liner Has Gangplank for Guests



"Crew" of the "Normandie" hotel on deck. The "ship" is constructed on land. Its odd design attracts many guests at Ostend, Belgium

Constructed to resemble the big ocean liner "Normandie," a hotel at Ostend, Belgium, is complete to the gangplank over which guests arrive and depart.

Manhole Sprayer on Motorcycle Delivers Death to Mosquitoes

Motorcyclists wage war on mosquitoes in the Chicago suburbs. A rider carrying spray equipment goes about the west suburban towns spraying manholes where mosquitoes might breed. One man can spray 400 manholes a day, and one treatment lasts ten days.



Inserting nozzle of spray in top of manhole, motorcyclist can quickly destroy breeding mosquitoes

Discarded Negatives Put to Use for Framing Pictures



Postage stamps and photographs mounted between old negatives from which emulsion has been scraped

Instead of discarding old photographic glass negatives, they may be used for framing pictures, documents, or postage stamps for exhibition. Soaking the negative in hot water will soften the emulsion, then it can be scraped clean. The picture or paper to be framed is placed between two pieces of glass which are then taped together around the edges with inexpensive lantern-slide binders. An ordinary paper clip can be fastened with tape to the back of the frame for hanging it on the wall. This double glass framing method is particularly useful in referring to the back of the picture for titles and other data.

Odors Frozen Out of Buildings Using Air Conditioning

Chemists have discovered a way to remove odors from air-conditioned buildings. Activated carbon, an improved form of charcoal, is the agent employed in a freezing-out method. Tests of the method were conducted by Dr. V. A. Gant of the University of Illinois and H. D. Shaw of the Pullman company in a railroad car of the club lounge type in which eating, drinking, smoking and sleeping were in

almost constant progress. The air in the car was composed of about twenty-five per cent fresh air and seventy-five per cent recirculated. Large proportions of tobacco smoke and various odors were drawn directly into the recirculated air intake. Solid carbon dioxide, contained in an insulated box, was the refrigerant used to freeze out moisture and odor in a condenser tube through which measured amounts of air were drawn at low velocity. An instrument called the osmoscope was employed to determine the relative odor value of the condensate by the air-dilution method. Previously the osmoscope had been used to assist the human nostrils in determining the odor value of water, but now it can be used to determine this value in air by first freezing out the water and odor in the air.

Spectro-Eye Tests Car Metals to Maintain Quality

To maintain rigid requirements, automobile factories are using the newly developed spectrograph to test metals and alloys. Under the spectrograph each element in metal or metal alloys appears as a definite color. Should the metal not be up to specification, the instrument would quickly reveal the fact by finding a color, or colors, different from those in the standard. The spectro-eye, as it is called, checks not only metals, but also completed parts.



Using the spectrograph in auto plant to test piston for quality of metals



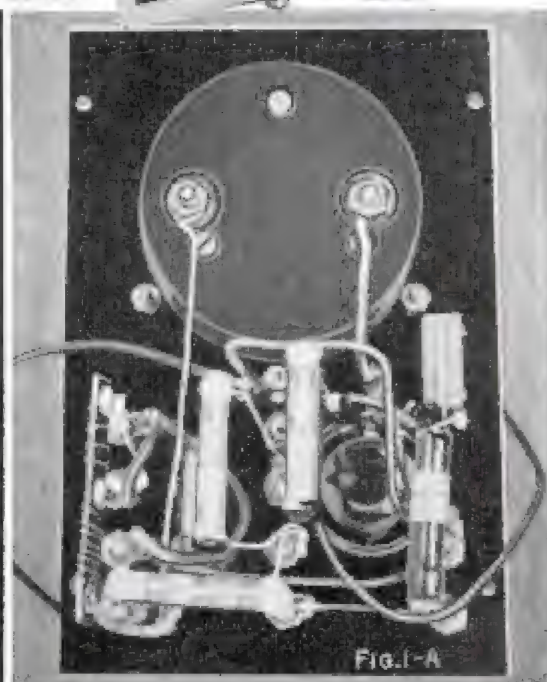
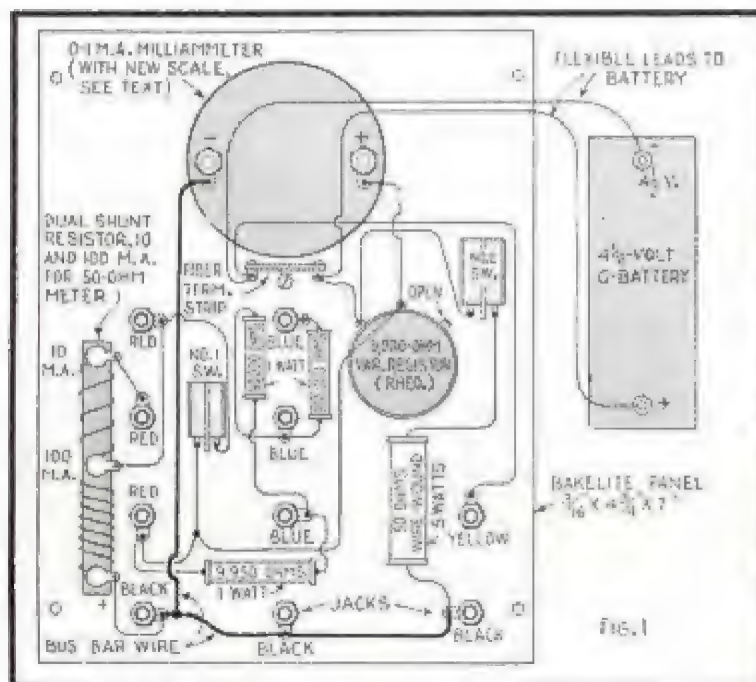
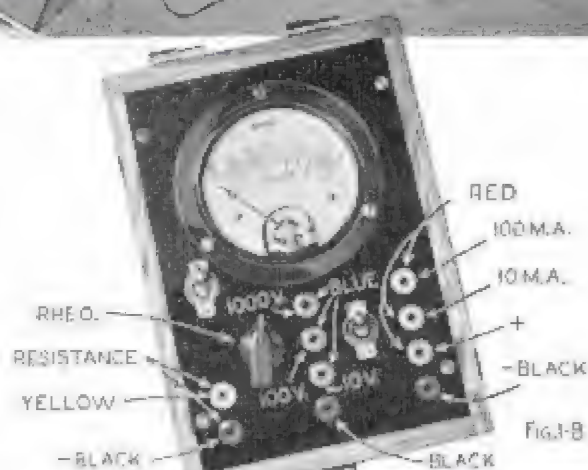
3 TEST METERS *in one unit...*

By M. N. Beitman

THIS inexpensive combination voltmeter, ohmmeter and milliammeter can be assembled easily by any experimenter and will provide a useful and accurate instrument for testing radio receivers, amplifiers and other electrical equipment. With this handy unit you can quickly measure d.c. voltage in steps of 0-100-1,000 volts; current of 0-1-10-100 milliamperes, and resistance—on full scale deflection—0 to 1,000 and 0 to 100,000 ohms.

Any standard 0 to 1 m.a. milliammeter may be used. A Weston model 301 with a new scale reading 0 to 1,000 ohms in reverse and 0 to 10 volts-m.a., is shown in this layout. A 4½-volt battery will per-

(Continued to page 152A)



Combs

W. H. H. H. H.

*1086 S. Broadway
Los Angeles, Calif.*

How to Build

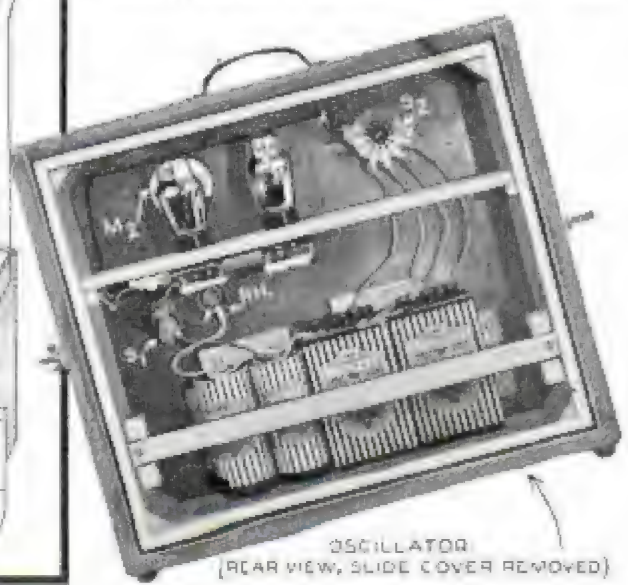
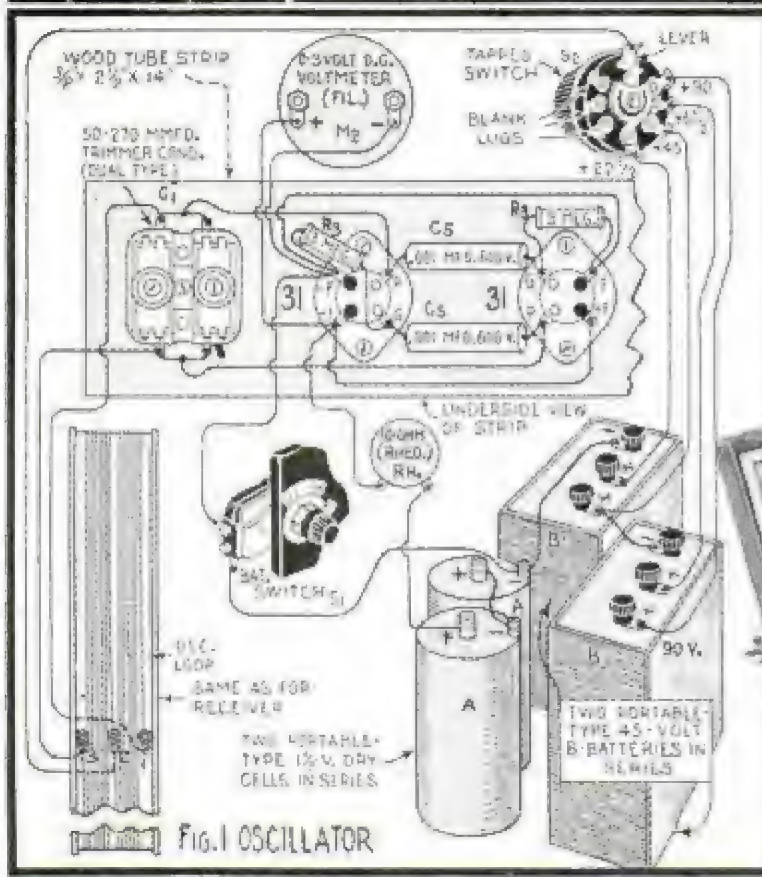


By
Harry A. Fore
PART I



A RADIO metal-locating device that actually indicates the presence and approximate depth of buried or hidden metallic bodies, offers the experimenter an interesting and sometimes profitable means of putting in spare time.

It is a well-known fact that high-frequency waves not only travel through clear space but also penetrate such non-conducting materials as rock, masonry and ordinary soil. Radio engineers soon learned that a conducting body, such as a sheet of metal,



RECEIVER
(REAR VIEW)

(Continued to page 144A)

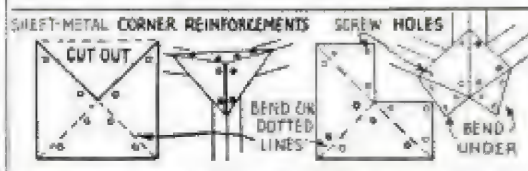
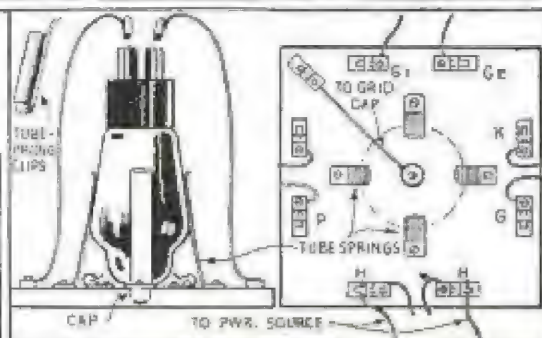
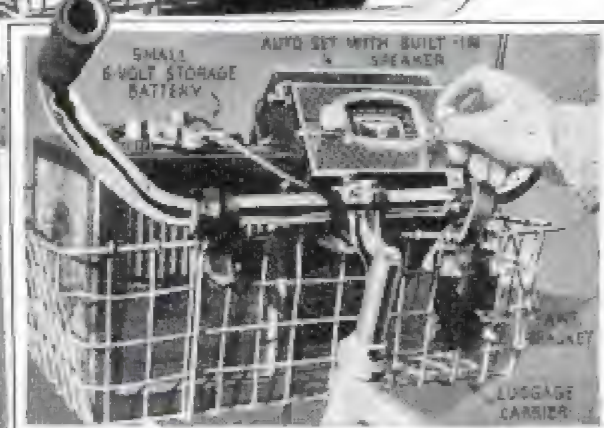


Johnson, Ray C. 12/11/71
Waseca, Minn.

RADIO
MENTERS

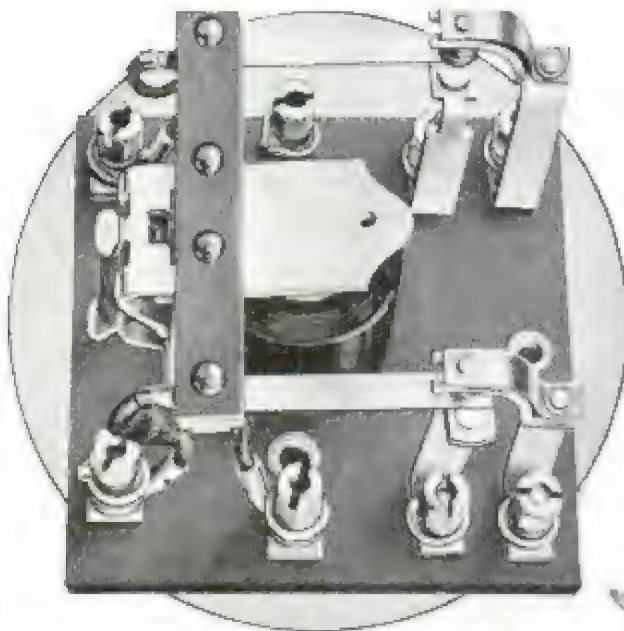
ROD-TYPE
← ANTENNA

vides a means for
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hile making routine
receiver is a self-
er. A small 6-volt



Sturdy corner reinforcements for radio rack replace triangular metal plates

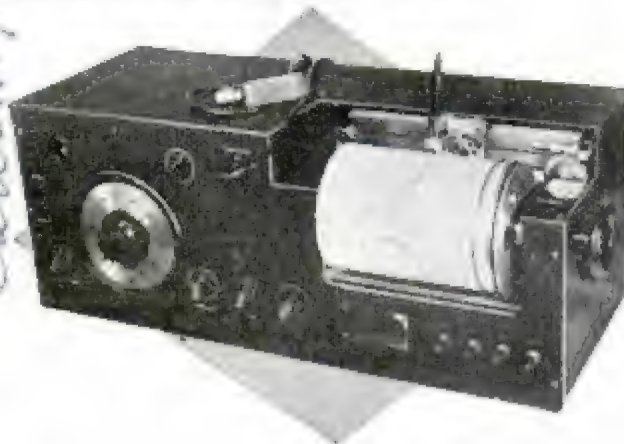
Relay for Antenna Switching



Midget radio-frequency relays of the d.p.d.t. type are now available for antenna change-over and for switching directional short-wave antenna systems. One variety operates on 6 volts d.c. and another is designed to work on 110-volt a.c. circuits.

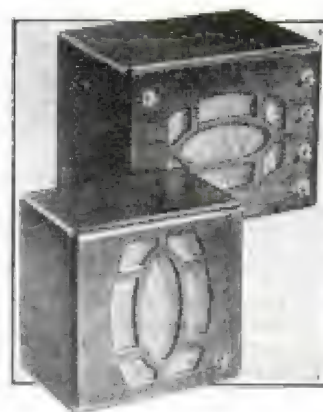
Recording Sound Frequencies

Variations in the audio output of loudspeakers are automatically reproduced in a permanent record directly on a motor-driven graph by means of this audio response recorder. A multicell crystal microphone picks up the sound vibrations set up by the speaker under test.



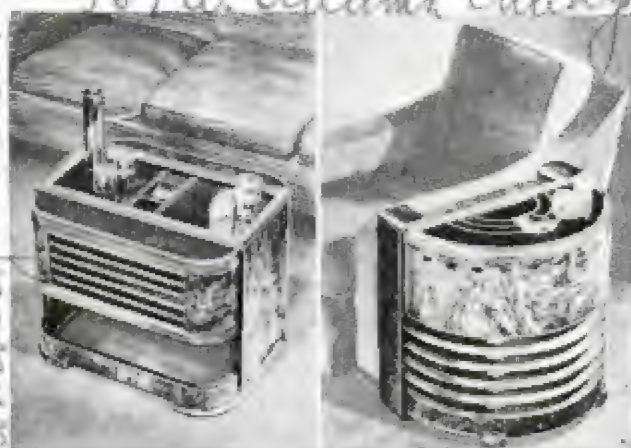
Inter-Office Call System with Master Station

In this system the master station is centrally located and connected with from one to four of the smaller unit sub-stations. The master station can talk to and receive from any sub-station, but the sub-stations cannot communicate with each other.



Arm-Chair and Coffee-Table Sets

Triple-range 7-tube receivers housed in attractive cabinets, one of which serves as



a coffee table and the other as an end table for an arm chair, have been displayed at recent radio shows. Both have 3-watt output, automatic volume-control and cover two popular short-wave bands in addition to the regular broadcast programs.

Blueprints covering radio construction articles in past issues are available for 25 cents each; original material lists and additional information can be obtained from our Radio Department without charge upon receipt of postage.

NEXT MONTH—How to Build a Table-Type Twin-Speaker Set. A sturdy "knock-about" T.R.F. 2-band receiver of unusual design; easy to build, has excellent tone and volume. Tunes broadcast band from 200 to 550 meters and short waves from 60 to 200 meters. Also, **Part II of the Eight-Tube Metal Locator**



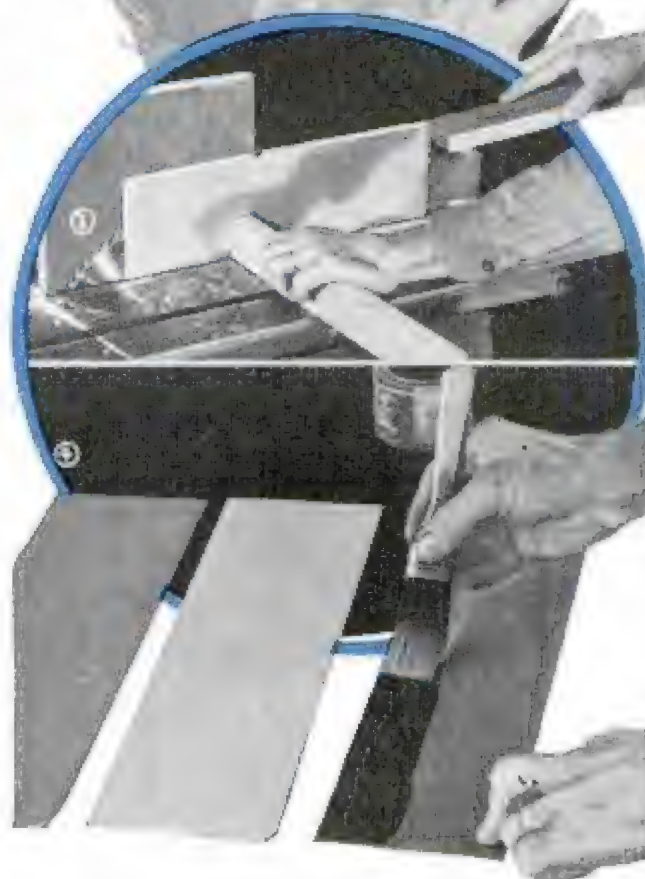
PAINTED INLAYS

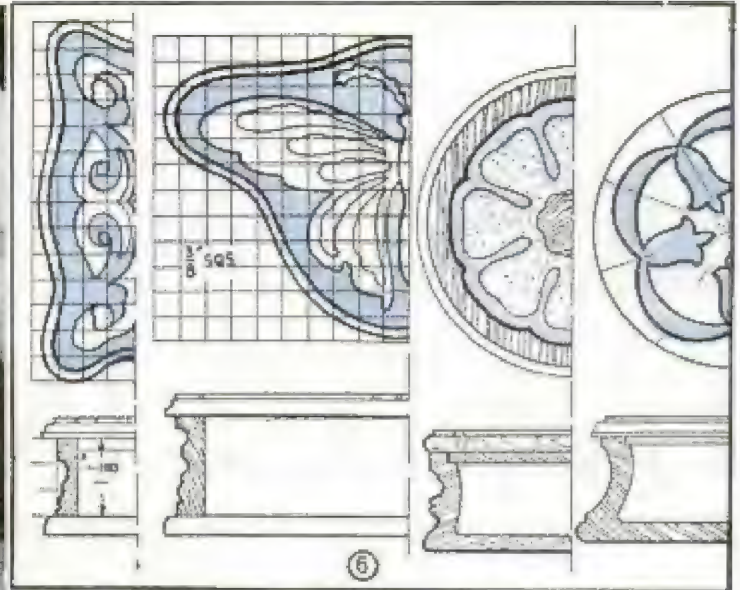
on your craftwork



By EDWIN M. LOVE

VENEERS of birch are best to use for this work. You can rip these to $\frac{1}{16}$ -in. thickness on the circular saw as in Fig. 3 or purchase them ready cut in this thickness. Sand one face smooth and build up a good body of paint with four or more thin coats of quick-drying enamel as in Fig. 4. If the paint is strained through fine-mesh cloth before using, and the undercoats are lightly rubbed with No. 6-0 sandpaper, a smooth final coat will result. Allow plenty of time for drying. The last coat should dry at least 36 hrs. before smoothing lightly with fine steel wool. Four colors can be worked up into a single inlay by stacking the veneers together, with two sheets of newspaper and one of wax paper between. Nail together with brads driven in the waste. Cut off projecting points, and rivet. In this way eight veneers can be cut at one time. Having prepared half-patterns by sketching them through squares as in Fig. 6, transfer the patterns to gummed paper with carbon paper, and paste to the top veneers. Jew-

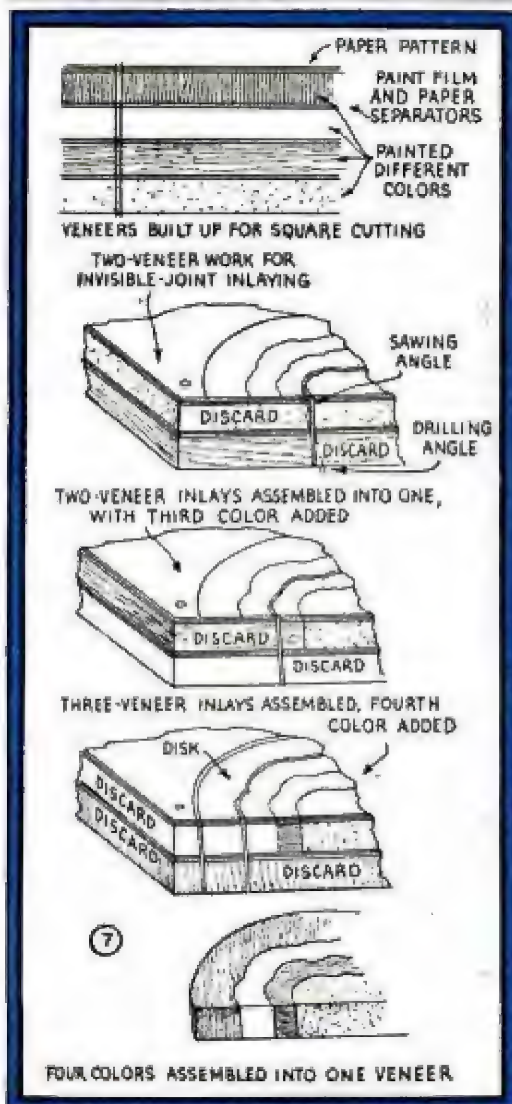




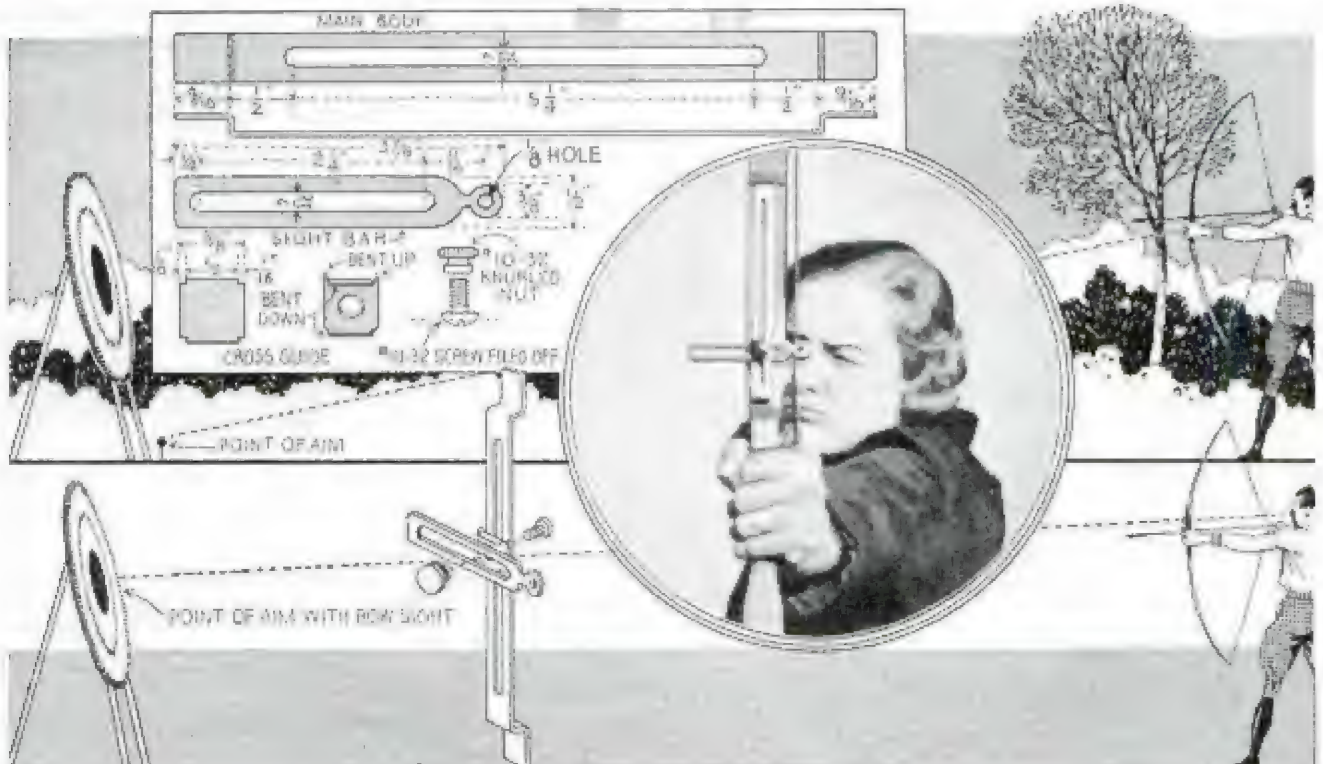
elers' blades, $\frac{1}{2}$ -in. size, will be found ideal for sawing with a power jigsaw. Drill holes in corners of the design as in Fig. 5, insert the blade, and saw on the lines as in Fig. 2. Cut inside parts first, attaching them upside down to heavy paper with thin liquid glue. Remember that material

has been removed by the saw, so you have to assemble to show saw kerfs of the same width all around. Of course, the color combinations are arranged at the same time, producing four sets of designs from four veneers. Now you glue the paper backing to a smooth board, clamping the veneers lightly until the glue sets. Then plane the backs to reduce all parts to the same thickness, and glue the whole thing to the box lid. When dry, remove the backing board by splitting the paper with a wide chisel or knife. The paper remaining on the lid can be soaked off with a damp cloth. Fill the joints with a soft paste made by mixing whiting with black paint, heaping the filler up in the saw cut to allow for shrinkage. When this has hardened, rub down with water and rottenstone.

If you wish to do inlaying which shows no joints, join two veneers at a time, and tilt the saw table enough to taper the cuts so that an upper section will wedge tightly into the space made by removal of a lower section. The exact amount of tilt can be found with experimental cuts on scrap veneers. When drilling the blade holes, tilt the veneers even more, so that the drill enters waste wood, crosses the line between the pieces, and emerges in the lower waste piece. This practically eliminates the holes when the inlays are assembled. A study of the four lower details in Fig. 7 will make the process clear. Examples of these inlays are shown in Fig. 1. Make the boxes by band-sawing the sides, scroll-sawing the insides, and gluing on plywood bottoms. Turned boxes are especially effective.



Sight on Archery Bow Improves Your Aim



Taped to your archery bow, this adjustable sight will be found a more satisfactory method of shooting an arrow than the "point-of-aim" method, as you aim right at the bull's-eye instead of sighting at a marker on the ground in front of the target. Thus, any variation in bowing or in distance is not likely to affect your aim. The parts of the sight are made of heavy sheet steel or brass and are cut to the shape and sizes given in the detail. When

finished, they should be polished with fine emery cloth. Nickel or chromium plating will improve their appearance. The sight is mounted on the back of the bow with the sight end of the cross bar extending to the left. It is adjustable either vertically or horizontally. Once set for a certain shooting distance, it may be marked so that when the same distance is shot again, the correct adjustment can be made quickly.

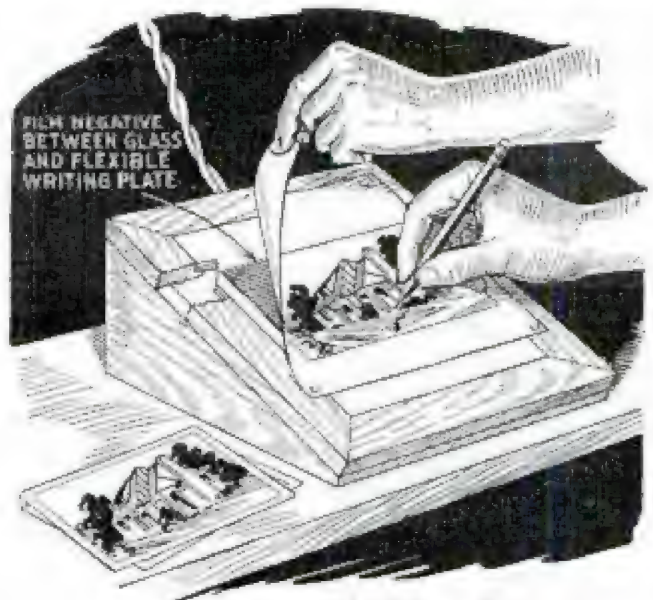
—Lester Nicholas, Chicago.

Sketch on Mimeograph Stencil Cut over Photo Negative

In copying a photo on a mimeograph stencil, I find that time can be saved and a good job done by using the negative of the photo instead of a print. The negative is inserted between the flexible writing plate and the glass, after which I trace on the stencil over the high lights of the negative to get the lines. A photo printed from the negative is studied as an aid in shading.

—Paul A. Bogossian, Brooklyn, N. Y.

❑The job of cracking nuts is made easy by using a vise; there is no danger of bruising the thumbs, the shells are not scattered over the room, and by turning the screw slowly and carefully, kernels often may be removed whole.



Handkerchief on Tennis Player's Shirt Easy to Reach



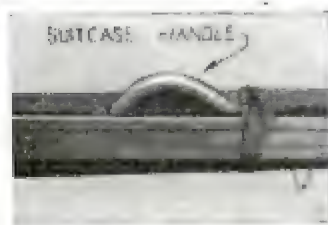
Buttoned on the front of a tennis player's shirt, a handkerchief is reached quickly during a fast game

When playing a fast game of tennis, and perspiration is likely to get into his eyes, one player buttons a handkerchief to his shirt so that he can wipe his face quickly. A buttonhole is made in one corner of the handkerchief, which is slipped over one of the buttons on the front of his shirt.

Simulating Windows for Models

When pieces of celluloid are to be used as windows for small models, the effect will be more realistic if cross lines, to represent individual panes, are impressed on them. A way to do this neatly is to lay the celluloid on a smooth, hard surface and cover it with a piece of copper screening. Pressing the screening with a warm iron will transfer the design to the celluloid.

Camera Tripod Carried by Handle from Old Suitcase



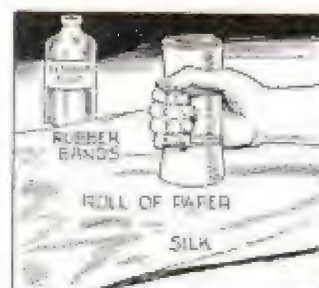
Screwed to one of the legs of a tripod, a suitcase handle provides a convenient hand grip for carrying it. When folded,

the tripod is bound with a strap to keep the legs from spreading. The handle, which is not in the way when using the tripod, should be located carefully so the assembly will balance when carrying it.

—Bernard L. Kobel, Frankfort, Ind.

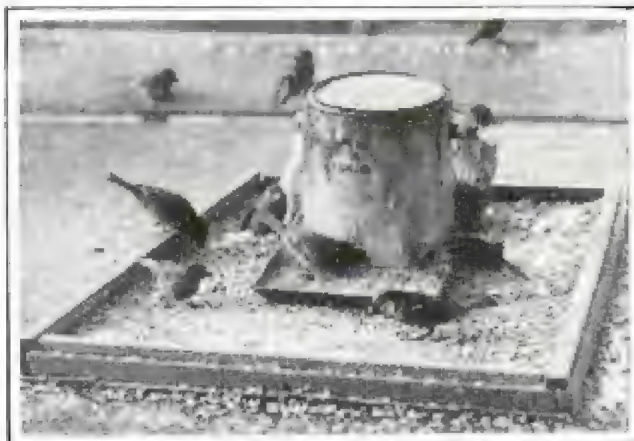
Cleaning Fluid Applied to Silk with Paper Roll

When removing stains from silk and other fine fabrics, you will often find that a compactly rolled piece of white paper makes a better applicator for the cleaning fluid than a cloth pad. The roll will not only apply the fluid without injuring the fabric, but the wet paper tends to loosen foreign matter more effectively than cloth. After the fabric has dried, clinging particles of paper are removed by brushing.



This Bird-Feeding Station Works Automatically

Easy to make, this bird-feeding station delivers the feed automatically to the birds as they pick it out of holes in the side. The feeder is nothing more than a 1-gal. pail

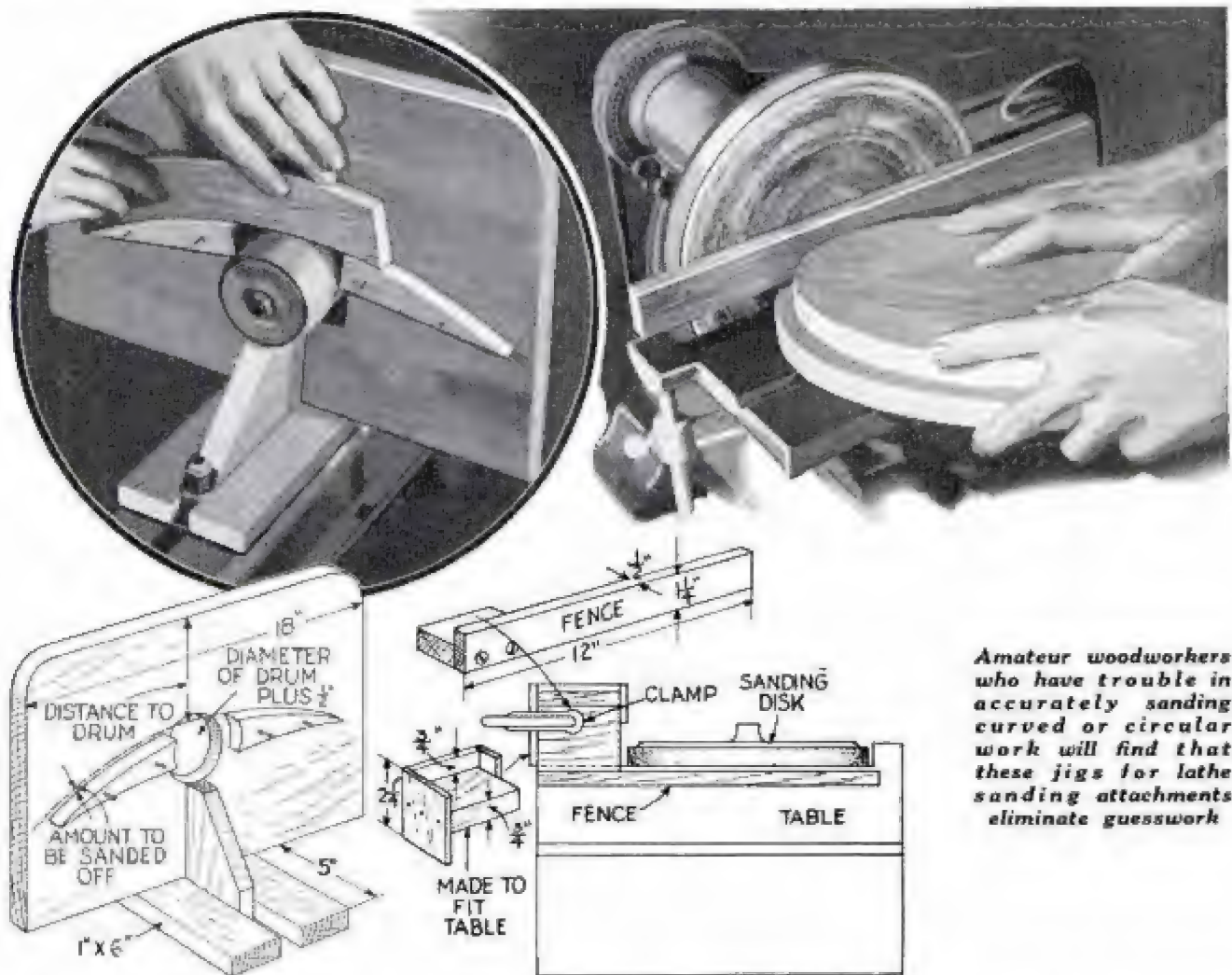


A 1-gal. pail with 1/2-in. holes drilled in the sides near the bottom makes this feeding station

with a tight-fitting lid, which has 1/2-in. holes drilled near the bottom. When filled, the pail is set into a large, shallow pan so that the feed is not scattered as it is picked out of the holes.

—Nelson Edwards, Baltimore, Md.

Two Lathe Jigs That Simplify Sanding Work



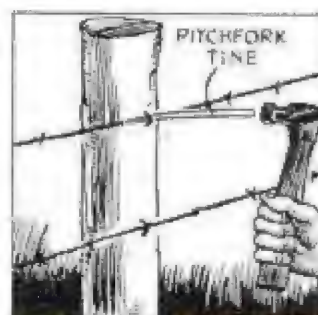
Amateur woodworkers who have trouble in accurately sanding curved or circular work will find that these jigs for lathe sanding attachments eliminate guesswork

Here are two jigs for your woodworking lathe that will help do accurate sanding jobs without special skill of the operator. The jig at the right is for smoothing circular work, and consists of a pattern and a fence clamped to the regular lathe sanding table. In use, the pattern is fastened to the work, after which the latter is fed under the fence into the sanding disk until the pattern bears against the fence. In cutting the pattern, allow for the thickness of the fence so that when the pattern touches the fence the finished work will be the correct diameter. Long, curved work is sanded on a drum as shown at the left. A vertical fence is clamped to the lathe bed and carries two curved pieces having the same arc as that of the work. Any variation in different pieces of work will require curved pieces having corresponding arcs. These are easily cut on a scroll saw, however, and the arc marked on each one for future use. The front piece should be dropped

below the top of the drum surface just enough to permit sanding to the desired depth; while the rear one is set flush with the drum to support the portion of the work already sanded.

—Edwin M. Love, Monterey Park, Calif.

Staple Puller from Fork Tine

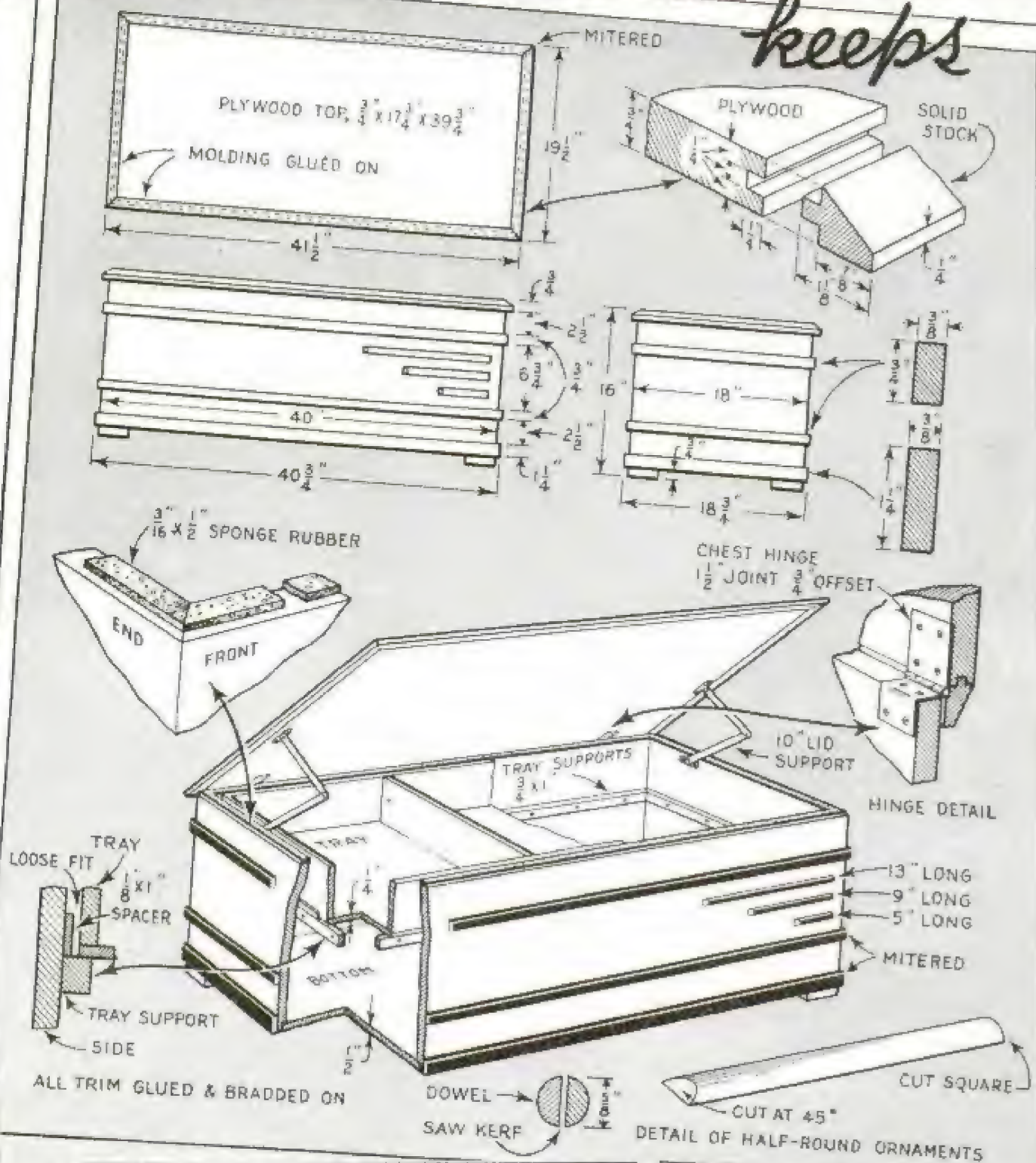


being tapered, the tine pulls the staple as it is driven under it. When pulled in this way, the staples are usually straight so that they can be used again.

If you have an old pitchfork lying around, saw off one of the tines and use it as a staple puller. The pointed end is easily started under a staple with a hammer and,

Tight CLOTHES

keeps



Built of $\frac{3}{4}$ -in. plywood, with a face of veneer of any wood you desire, this tight chest is the place where cleaned garments will be free from moths. A tray for small pieces is partitioned to suit and has handholes for lifting it out to provide access to larger articles

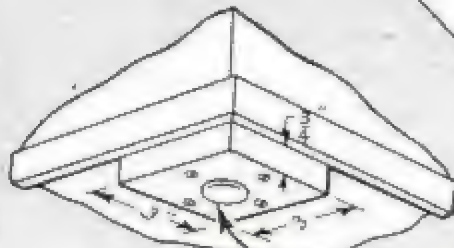
**POPULAR
MECHANICS
MAGAZINE**

CHEST

out moths

LID, SIDES AND
ENDS, $\frac{3}{4}$ WALNUT
PLYWOOD

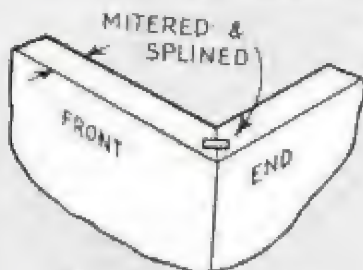
ALL TRIMMING
ENAMELED BLACK



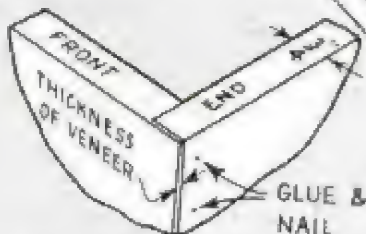
DETAIL OF BASE BLOCKS



$\frac{1}{2}$ " SLIDING DOME

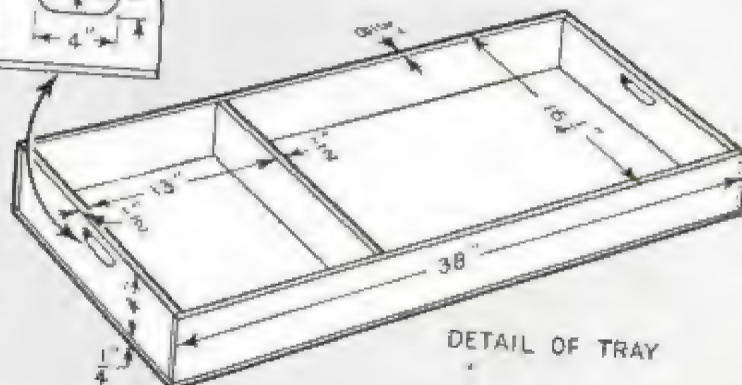
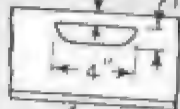


MITERED &
SPLINED

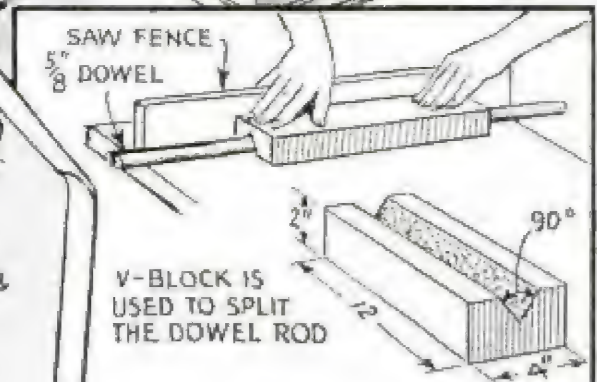


GLUE &
NAIL

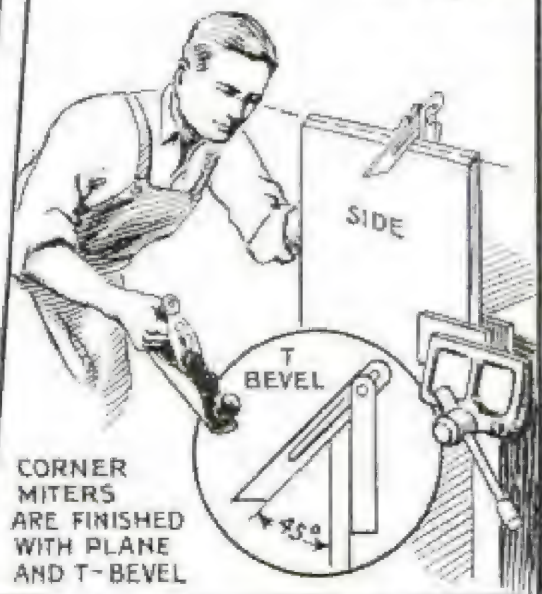
ALTERNATE METHODS FOR CORNER JOINTS



DETAIL OF TRAY



V-BLOCK IS
USED TO SPLIT
THE DOWEL ROD



CORNER
MITERS
ARE FINISHED
WITH PLANE
AND T-BEVEL

SHEET NO. 1

ISSUE

POPULAR MECHANICS MAGAZINE
200 E. ONTARIO ST. CHICAGO

BLUEPRINT No. SN 970

Plumb Bob Aids Precision Set-Up of Shop Machines



Unless lathes and other machines are properly set up, the work turned out may be inaccurate, the bearings may be damaged due to being out of line and, in case of a lathe, the carriage will not ride cleanly. An ordinary carpenter's level serves only as an approximate indicator for alignment. The test must be carried a step further. The simple device shown will detect slight warpings of the machine bed, so that with the aid of metal shims placed under the legs, the undesirable twist can be corrected. The base of this device is a metal straightedge with two wooden strips completing a triangle, the vertex of which supports a plumb bob or other symmetrical weight by a fine wire or a strand of silk. The position of the line is compared with the markings on a scale on the base when the straightedge is set across the ways of the bed at right angles. When the readings taken at both ends of the machine are alike, the bed is straight. The plumb line must neither touch the scale nor be so far away from the scale as to risk parallax. The sighting of the reading should be in line with the bed, and the arrowhead marked "x" on the straightedge should be set over points on the ways that correspond at each end of the bed. Theoretical-

ly, sensitivity will be increased if the upright supports are lengthened, but with the size shown, it was possible to detect a variation as small as .0005 inch (across a bed about 6 in. wide).

—E. J. King, Baltimore, Md.

Tray to Carry Ice-Cream Cones Made of Chicken Wire

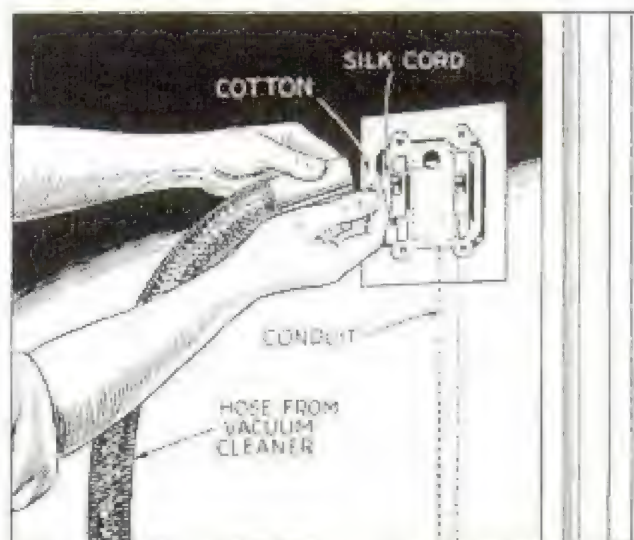
For use at road-side stands, this tray is just the thing for serving ice-cream cones to customers at the curb. It is nothing more than a piece of chicken wire



stapled to the underside of a light wood frame. It's a good idea to use strips of molding to cover the edges of the wire.

Wire Pulled Through Conduit With Aid of Vacuum Cleaner

A difficult job of getting an extra wire through an old electrical conduit was done easily with the aid of a vacuum cleaner. With the cleaner sucking on one end of the conduit, a piece of cotton, attached to a light silk thread, was pulled through, after which it was no trick to bring a heavier cord through by tying it to the thread. The cord was used to pull through a length of stovepipe wire, which was then used to pull through the insulated wire.



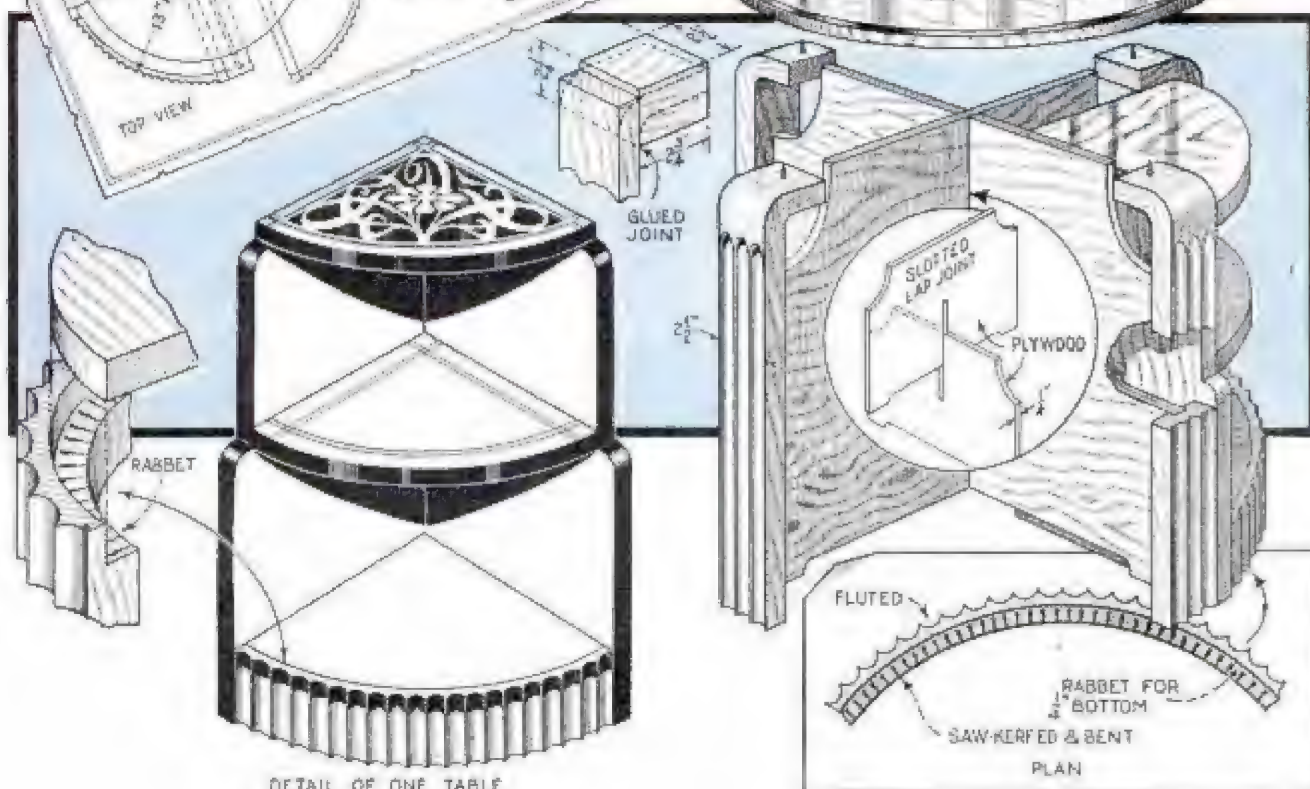
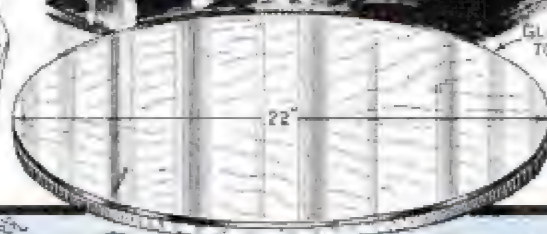
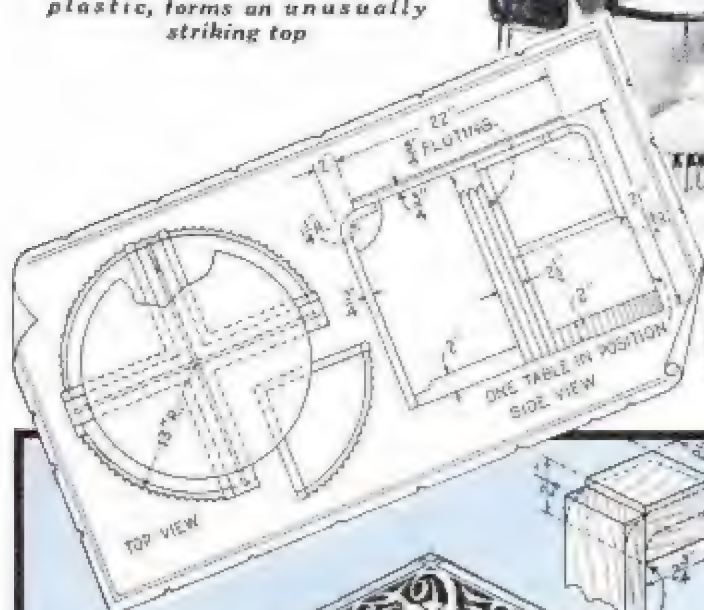
Suction hose of vacuum cleaner helps to get wire through old electric conduit in wall

Modern

NESTED TABLES

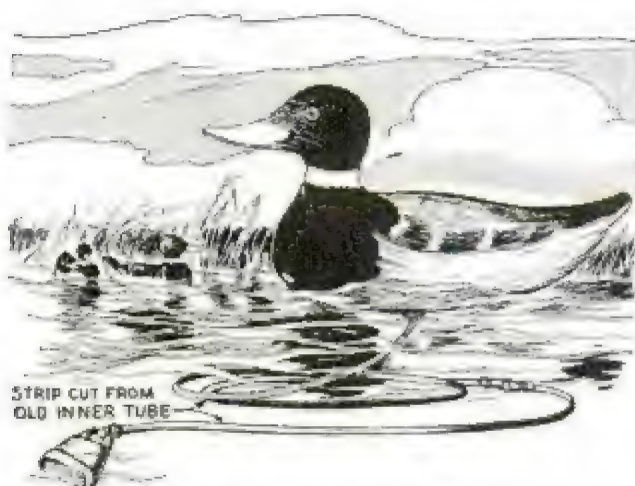
save space

Afternoon tea may be served individually on four small tables that nest compactly into one. The design is pleasingly modern, the construction may be largely plywood, and the finish is bone-white enamel. Fluted banding at the base is easily formed by first fluting across the width of straight stock and then saw-kerfing the back so that each piece can be bent to the proper curvature. A mirror, a disk of plate glass or one of plastic, forms an unusually striking top.



DETAIL OF ONE TABLE

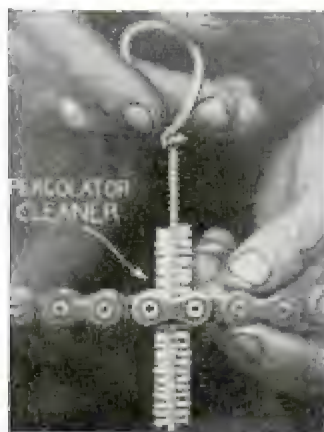
Duck Decoys Given Appearance of Swimming in Water



Rubber anchor "ropes" on decoys allow them to move over surface of water as though actually swimming

To give his duck decoys the appearance of actually swimming around in the water, one sportsman ties a strip cut from an old inner tube to the bottom of each one and to an anchor. The strips should be cut about $\frac{1}{2}$ in. wide and from 4 to 6 ft. long to be most effective. This length should be used in water from 3 to 4 ft. deep. When put in the water, the decoys are moved by wind or current of the stream until the pull of the rubber is strong enough to overcome the force of the wind or current and move the decoys back toward the anchor. This action is continually repeated, tending to give the decoys the appearance of swimming.

Bicycle Chain Cleaned Quickly with Percolator Brush



The messy job of cleaning a bicycle chain can be simplified by use of a small percolator cleaning brush. To use it just hold a small can of gasoline under the chain, and pass the brush back and forth through the links, letting the end dip into the liquid each time it passes through a link. For chains that are too small to use a percolator brush, pipe cleaners can be substituted.

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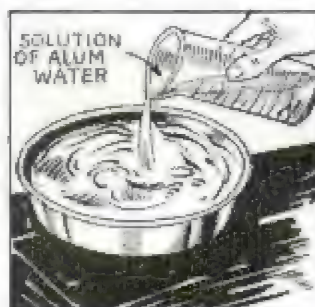
With this method your hands do not come in contact with either the gasoline or the grease removed from the chain as the brush, in passing through the links, washes the grease into the gasoline can.

Small C-Clamps from Clevises of Auto Brake Rods

The next time you need some small C-clamps, try using the clevises found on the ends of brake rods. These usually can be obtained from a junk yard for a few cents. Pick out the type of clevis which has the hole in one side threaded to take a bolt. The head end of the bolt can be flattened easily to provide a finger grip.



Papier-Mache Improved by Alum



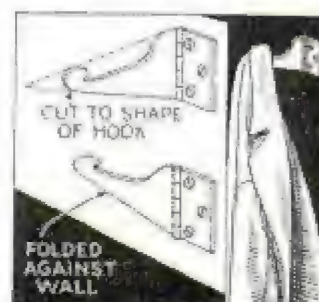
While experimenting with papier-mache, which consisted of pulped newspaper, glue and a little plaster of paris, I found that excessive shrinkage could be avoided by adding a solution of alum to the mixture. The solution was made by adding all the powdered alum that it would dissolve.

—A. H. Waychoff, Tempe, Ariz.

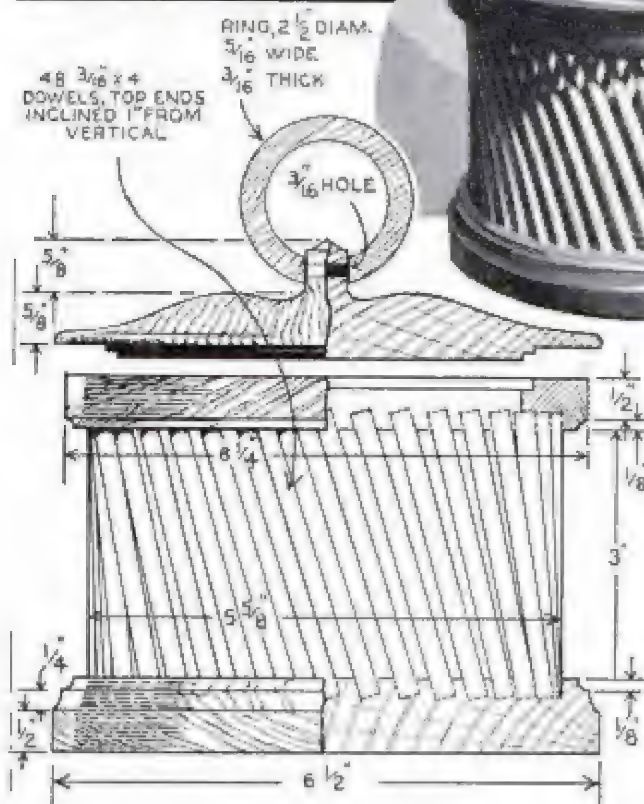
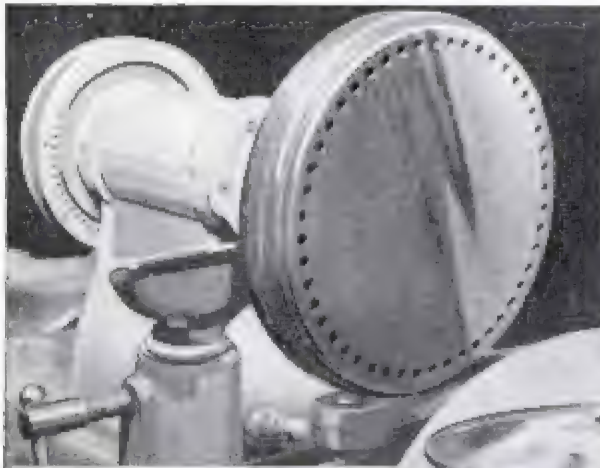
Clothes Hook from Door Hinge Folds Back When Not in Use

Besides holding everything that can be hung on a regular clothes hook, this one has the advantage of folding back against the wall when not in use.

Only a few minutes are required to cut or file a hinge to shape, and mount it on the wall.



This Novelty Box Looks Like It's Twisted



This utility box has a novel twist in design. The sides are formed from dowels set at an angle, giving the effect of a spiral weave. The bottom is simply a wood disk and the top is the same with the center cut away to form a ring, one edge of which is rabbeted for a close fit of the cover. First you turn the disks to 8 in. diameter and scribe two concentric circles on each, one $7\frac{1}{2}$ in. in diameter, the other $5\frac{1}{2}$ in. Then you space the circles into 48 divisions each, and drill an equal number of holes centering on the outer circle and going clear through the disk. This done, you make a jig by driving two small pins, or $\frac{3}{16}$ -in. dowels into a block of wood, the pins being placed in such a position that they will en-

gage two holes in the rim of the top and bottom disks. The idea of the jig is to assure uniformity when drilling the inner row of slanting holes, which is done by clamping the jig to the drill-press table and setting the

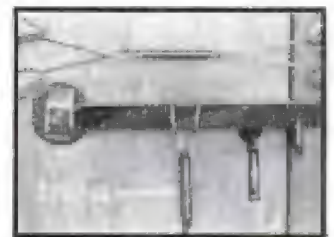
latter at the proper angle. Once you have the setup made and adjusted it takes but a few minutes to drill the slanting holes to a depth of $\frac{1}{2}$ in. in both the top and bottom pieces. When the holes are drilled you turn down the disks to $6\frac{1}{2}$ in. in diameter, after which dowels of equal length are glued in place and finished in the natural color to contrast with the top and bottom.

—Dale R. Van Horn, Lincoln, Nebr.

Spring for Door Latches

If you have a latch of the type shown, and the spring is broken or is weakened so that it does not hold down the latch bar, it is easily repaired with a small coil spring. A coil spring of the type used to hold covers on ironing boards is ideal for the purpose. Just slip the wire fastener at one end of the spring over the latch bar, pull down the spring to get the right tension on the bar and attach the other end to the door with a small staple.

—Frank Bentley, Jr., Missouri Valley, Ia.





W. B. 1.

The

**BUILDING
A MANTELPIECE
MODEL OF THIS
FAMOUS RACING
STEAMBOAT**

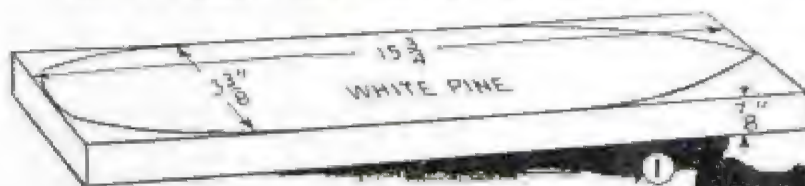
WITH the old river steamboats, races sponsored by rival owners were staged to decide the speed supremacy of their craft. To the competing owners, victory meant the cream of the passenger and freight-carrying trade. Most of these races are now forgotten, but the one between the two famous Mississippi steam packets, "Robert E. Lee" and the "Natchez," in 1870, still stands as the greatest of all time. Along the entire 1,278 miles of the great river, between New Orleans and St. Louis, people swarmed the banks to get a glimpse of the puffing racers as they passed. The "Lee" won. Leaving New Orleans at 5:00 p.m. on June 20, 1870, she steamed up current to St. Louis in 3 days, 18 hours and 14 minutes, averaging over 14 miles per hour including stops. She was 300 ft. long, 44 ft. wide and 10 ft. deep in the hold. Her side wheels measured 38 ft. in diameter and were driven by two engines of 40-in. bore and 10-ft. stroke. Steam was supplied by eight boilers mounted on the main deck.

Making the Hull: The little model described here has been simplified so that it is very easy to make. First is the hull,

made from a white-pine board as in Fig. 1. Referring to the plan, Fig. 3, which is half size, a carbon paper is used to transfer the sheer line, bow and stern curves to a cardboard pattern which is cut out to shape. The pattern is tacked to one edge of the board and a pencil line is drawn on the wood around it. See the side view, Fig. 3. Next, a cardboard pattern is made from the top view and the profile transferred to the board. Then the hull is rough-cut to these pencil lines, and smoothed to contour with a spokeshave and sandpaper.

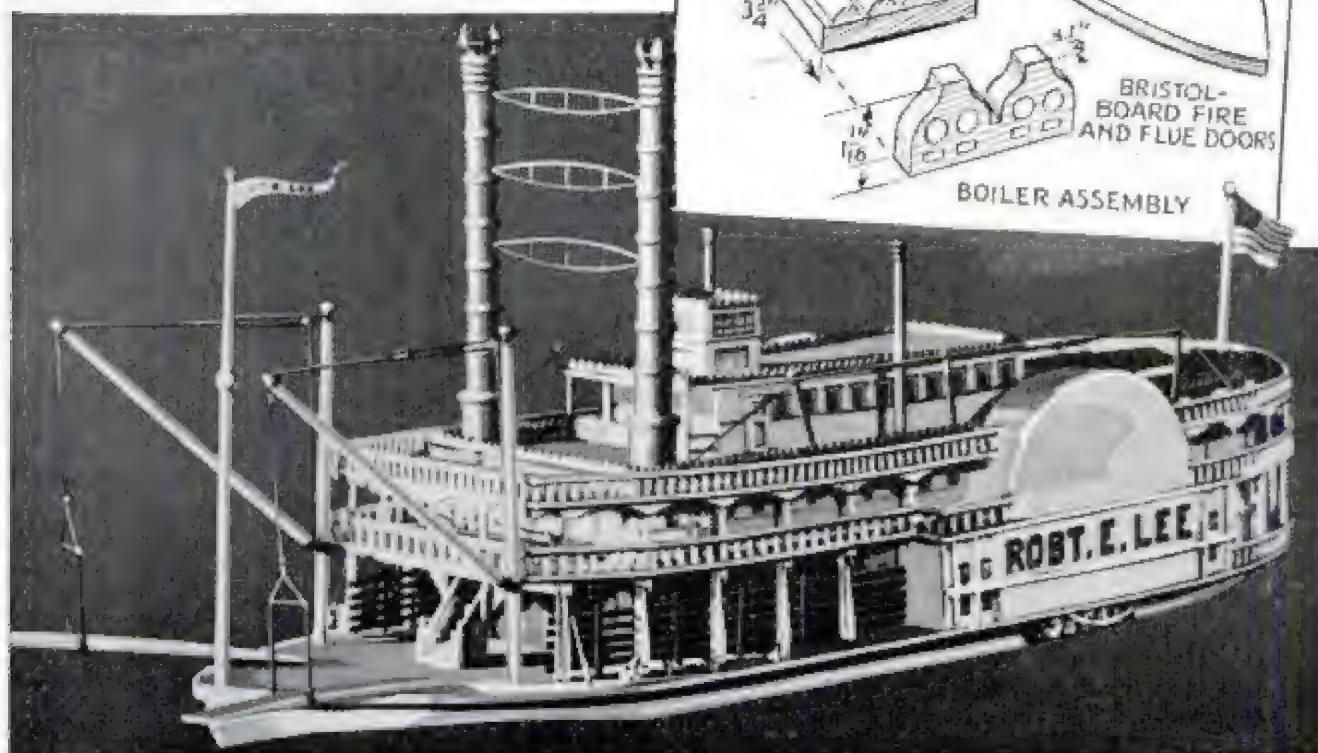
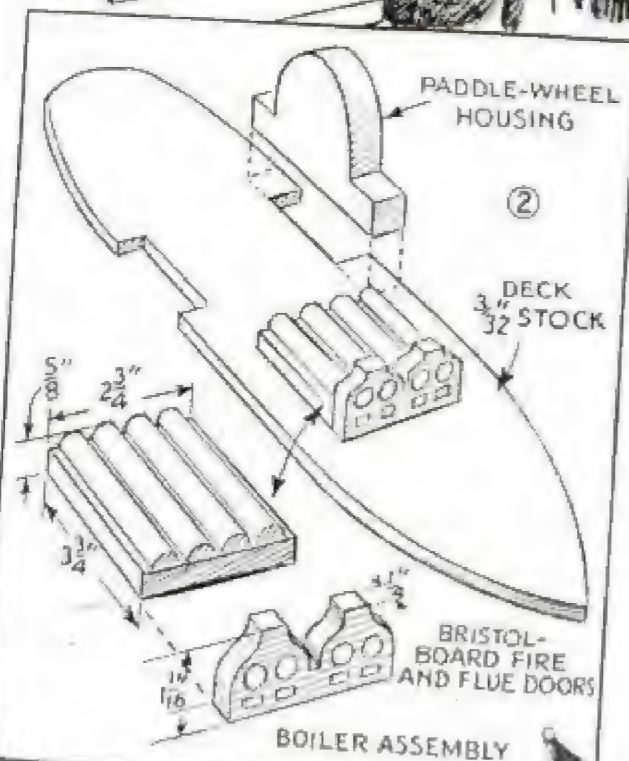
The Main Deck and Wheel Housings: After completing the hull, a main deck is made of thin wooden strips about $\frac{3}{4}$ in. thick by 1 in. wide and glued on straight fore and aft, Fig. 2. Note that this deck overhangs the hull at the sides, forming "guards." As shown in Fig. 2, dummy housings are formed by three blocks. The enlarged plan will show the sizes of these parts. Five of the wheel spokes show below the guards. Pairs of these are glued opposite each other on the thin wood-block covers which fill the notches made in the deck, Fig. 2. The covers are then

"ROBT. E. LEE"



glued to the blocks, and paddle blades or buckets are glued on to join the spoke pairs. The blades and the reinforcing circular band on the outside of the spokes are cut from light cardboard. When the housings are made, they are set into position on the main deck.

Upper Works: Three blocks of white pine, sawed to the shapes and sizes detailed on the half-size plan and shown in Fig. 4, comprise the main upper structure. When the blocks are assembled with small, countersunk nails and glue, the thin wooden cabin deck is glued flush against the middle block as shown at the left in Fig. 4. This deck is notched to provide a good snug fit against the wheel housings, to which the second assembly is fitted as it is being made. Note that, to duplicate the boat's lines properly, the upper decks parallel the curve of the sheer line, while the vertical sides extend straight up and down.

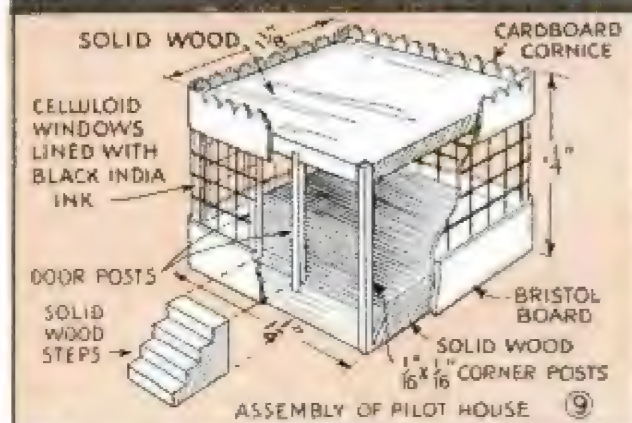
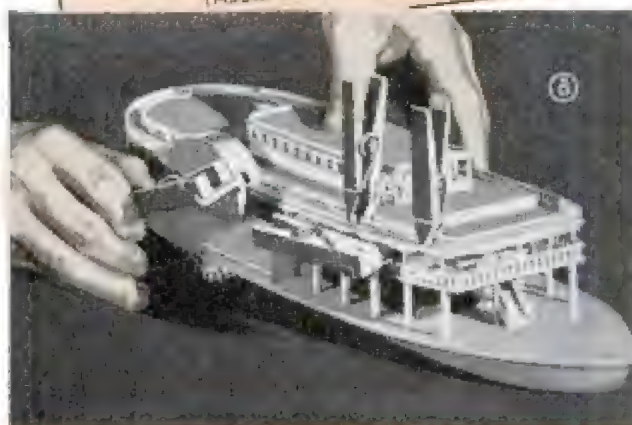
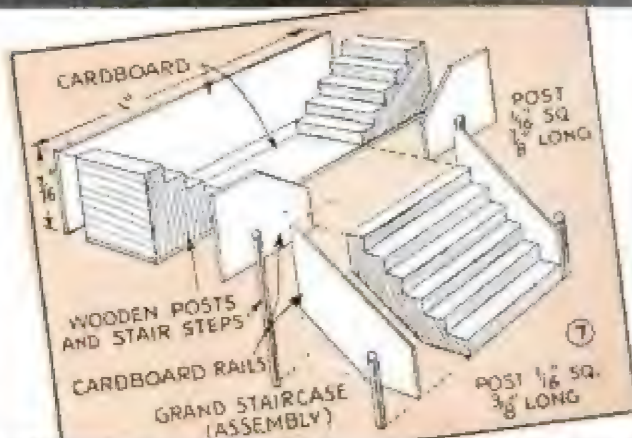


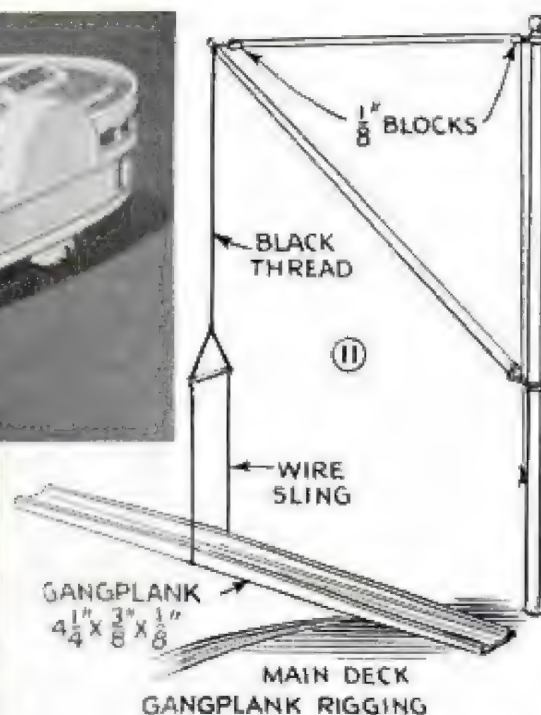


Doors and Windows: Now comes the first of the "gingerbread" work. When the upper structure is ready, strips of cardboard are shaped to cover the space between the cabin and hurricane decks. The window and door openings are cut out of the paper with a razor blade, given an all-over coat of flat white paint, and sills, sashes and trim are painted around them with battleship gray. Celluloid windows may be fitted at this point, or, the window openings may be painted a light blue with white "reflection" streaks over the blue. Clear varnish is then applied to provide the required shine. The door panels are gray with surrounding white. The cardboard is, of course, glued to the wood. To further embellish the model, small half-round wooden moldings may be applied just under the line of windows. Following this, the hurricane deck, Fig. 6, is fitted and glued into place. Now all other doors, windows and decorations are cut out and glued into place, making the model appear as in Fig. 8, except for the staircase and opening and the boilers. These parts are made, fitted and attached in place with light nails and glue, Figs. 2, 3 and 7. All decks are now painted battleship gray and the upper works attached permanently.

Rails and Stanchions: The rails are cut out of cardboard, fitted around their respective decks and given thickness by reinforcing half-round wood strips glued along the upper and lower edges. Sizes of the stanchions between decks and for the "Texas" porch are taken from the plan, Fig. 3. These are primed with white paint before fitting and attaching. Later, a second touch-up coat finishes them. A coaming is now glued onto the main deck forward and is shaped while in place with a flat chisel, as in Fig. 10.

Boiler Palings: Fence-like horizontal palings of wood, painted black, are at-





tached with lill pins and glue to the inside of the main-deck stanchions. Aft, vertical white palings are cut from cardboard and glued in position just below the window molding. The spaces between are painted with Van Dyke brown oil color to simulate depth. Three tiny bitts, shown in Fig. 10 and on the side view, Fig. 3, are now shaped from wood, pinned through from the bottom and glued into place.

Stays to Guards: Each of the forward stanchions is stayed to the guards by No. 26-gauge copper wire and equipped with turnbuckles at the lower ends. The turnbuckles are merely short lengths of the wire soldered on opposite sides and filed to rounded tops and bottoms. A coat of shellac followed by flat-black paint will color the stays. The hog-chain poles, es-

cape pipes and stacks are all turned or whittled from hardwood. So are the flagpoles and derrick booms. These are scaled from the plan and are painted white or black before application. Except for the booms, the other uprights are doweled at the lower ends and set into holes with glue in their respective positions. Light copper wire, fitted with turnbuckles in the same fashion as the guard stays, is now stretched over the supports to represent the hog chains. The wire ends are passed through the deck.

Pilot House and Skylight: Fig. 10 shows the assembly of the pilot house, and details of the main cabin skylight can be taken from the two views of the plan, Fig. 3. In both parts, celluloid windows are fitted. The pilot-house windows are lined with black India ink. Lill pins and glue will attach these units securely to the model. The gangplanks or landing stages, Fig. 11, are built up from thin wood, painted gray and white. Black button thread and 1/8-in. single blocks, will do for the simple rigging. No. 26-ga. copper wire is used for the gangplank slings and for the three ties between the smokestacks. The wire parts are painted flat black. Make the oak leaves on the stacks from thin sheet brass. The rudder is whittled from thin wood.

Final Painting: Only four major colors

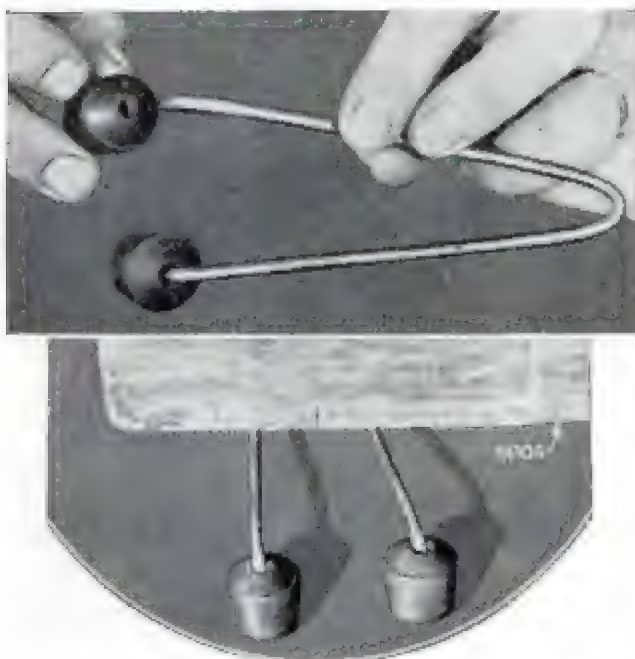
are used for the entire model; flat white as a ground color, gray for decks and trim, black for the stacks and other parts, as noted, and bronze powder for the "gingerbread" points and tips. The hull is white. The name "Robt. E. Lee" on the wheel houses is black with gray shading. Addition of the two flags completes the model.

Making a Base: An attractive base for the model can be made from hard maple, walnut or mahogany, shellacked and varnished. To support the model, two $\frac{1}{2}$ -in. lengths of $\frac{1}{2}$ -in. dia. brass tubing are cut off and long wood screws driven through the base and tubes into the hull as in Fig. 12. To prevent marring a mantel or table, a piece of felt should be glued over the bottom of the wooden base.

Spring Doorstop Easily Made

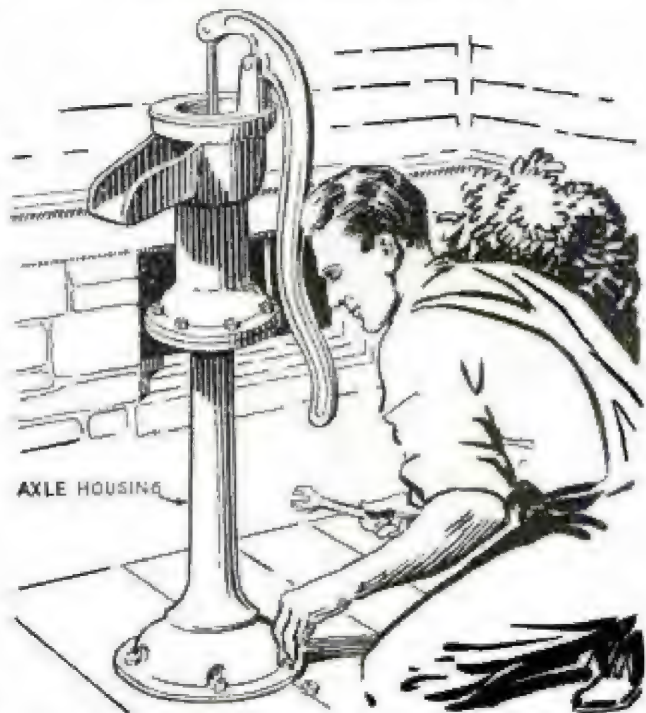
Here is a good doorstop that you can make in a minute, and it will not mar the door. A length of heavy spring wire is bent at right angles at the ends, the latter being inserted into the fuller balls, which are used in some water faucets. In use, the stop is slipped under the door as shown in the lower detail. The wire gives a spring action and tends to hold the ends of the balls tightly against the floor. The greater the pressure exerted by the door, the tighter the stop grips the floor.

—Wilbur Ennis, Los Angeles, Calif.



Quickly improvised from a length of stiff wire, this doorstop will not mar the floor

Pitcher Pump on Axle Housing Is Mounted Rigidly

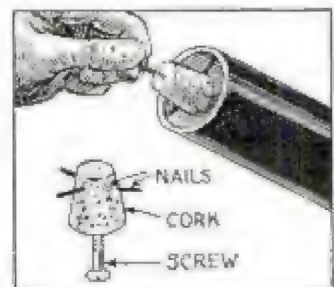


Pitcher pump is mounted rigidly at right height when bolted to one half of upturned axle housing

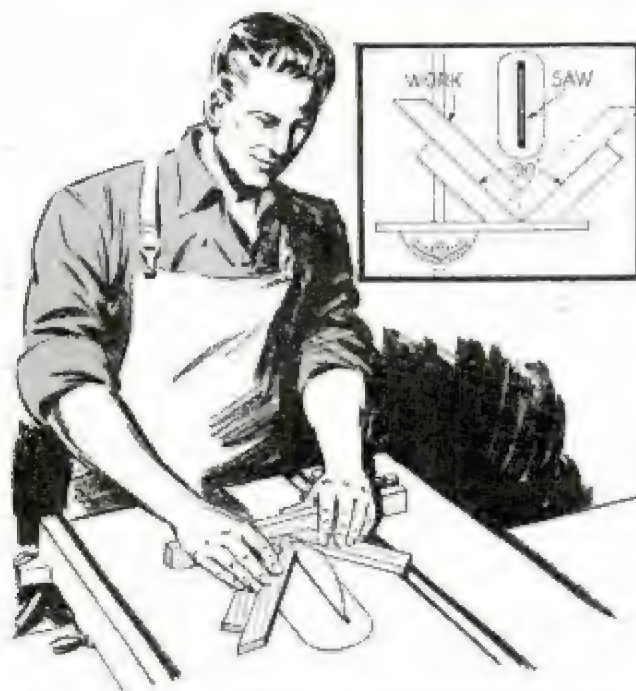
If you want to use a pitcher pump in a well or cistern outside the house, a good mounting to raise it to the proper height for easy use can be made from one half of an auto rear-axle housing. The bell end of the housing is bolted to the well platform and the base of the pump is bolted to the brake end of the housing, thus making a strong rigid mounting.

Calipers Improvised from Cork and Thin Nails

When inside calipers are needed and none are at hand, a pair can be improvised quickly from a cork and nails. Just push the nails partly into the cork on opposite sides. Then insert the assembly inside the work to be calipered and pull out the nails until their ends touch the walls of the work. After removing the assembly, measure from the end of one nail to the end of the other to get the inside measurement of the work.



V-Shaped Jig on Saw Saves Time in Cutting Miters



Mitering jig for circular saw saves time on work which requires cutting of many duplicate pieces

To quickly make true miter cuts on each end of the work without changing the position of the miter gauge of my saw, I used this wooden jig, which can be attached to the gauge as shown. By simply changing the work after each cut from one side of the jig to the other, accurate miter cuts are made quickly, as no time is lost in adjusting the gauge. Where the nature of the work requires duplicate cuts, as in production work, this jig saves considerable time.—Wayne C. Leekey, Aurora, Ill.

Have You a Dandelion Lawn?

In an outlying section where dandelions are plentiful and home owners are waging a constant and usually a losing battle to keep their lawns free, one lot is conspicuous by the complete absence of dandelions. The secret is the proper use of ammonium sulphate, which renders the soil chemically unfit for dandelions to thrive, and at the same time furnishes nourishment to the grass. This chemical should not be used during the heat of the summer because of its burning effect on vegetation including grass. But you can apply it safely during the relatively cool weather of spring and fall. Use about 3 or 4 lbs. per 1,000 sq. ft. of lawn—not a greater amount.

Two applications during the spring, about four weeks apart, have been found effective. You can mix the chemical with sand and distribute it as uniformly as possible or you can dissolve it in water and sprinkle the solution. With either method, the application must be followed by a thorough soaking with the hose so that the chemical will be watered in thoroughly. Ammonium sulphate is also a fertilizer for grass as it provides a liberal supply of nitrogen. This causes the grass to grow considerably above ground at the expense of the root system. To offset this objection, other balanced commercial plant food should be provided. This can be done in September or even during the summer months if it is well watered after being applied.

Painter Suspends Swing Seat from His Ladder

When working on a house where the nature of the eaves prevented use of hooks to support his scaffold, one painter suspended a swing seat from his ladder. This was done by means of iron hooks, a rope and pulley as indicated. With this arrange-



This workman paints a wide strip from top to bottom of building without getting off his seat

ment, the painter could cover a wide strip from the top to the bottom of the building, without getting off his seat, by lowering it as the work progressed downward.

Vaughan's Seed Store
 601 W. Jackson
 Chicago

Chair fits flush **KNEE-HOLE DESK**



Plenty of drawer space, a secret compartment and bookshelves. Back of chair folds down on the seat to clear center desk drawer

By WALTER T. WARDE



HOUSEHOLD bookkeeping, social correspondence or home study are a pleasure when you have a desk like this. There's a file drawer, open compartments for notebooks and magazines and a place for the typewriter. The underside of the glass top is enameled in jade green, and the charm of bone-white enamel is further enhanced by a simple aluminum band inlay in "natural" finish. Of course, you can change this suggested color scheme to suit the room decoration or to agree with your own ideas. Telescoping the chair into the knee hole of the desk effects an econ-

omy of space and at the same time gives you two matched pieces that fit in with almost any type of home furnishings as individual units.

The first step has to do with construction of the frame as detailed in Figs. 2 and 3. This is made of 1 by 1-in., and $\frac{3}{4}$ by $\frac{3}{4}$ -in. hardwood, glued and screwed together as shown. At the same time the framework for the chair as shown in Figs. 9, 10 and 11, is made and set up by the same procedure. Next, the bases for the chair and the two pedestals of the desk are mitered and made ready for screwing to the underside of the

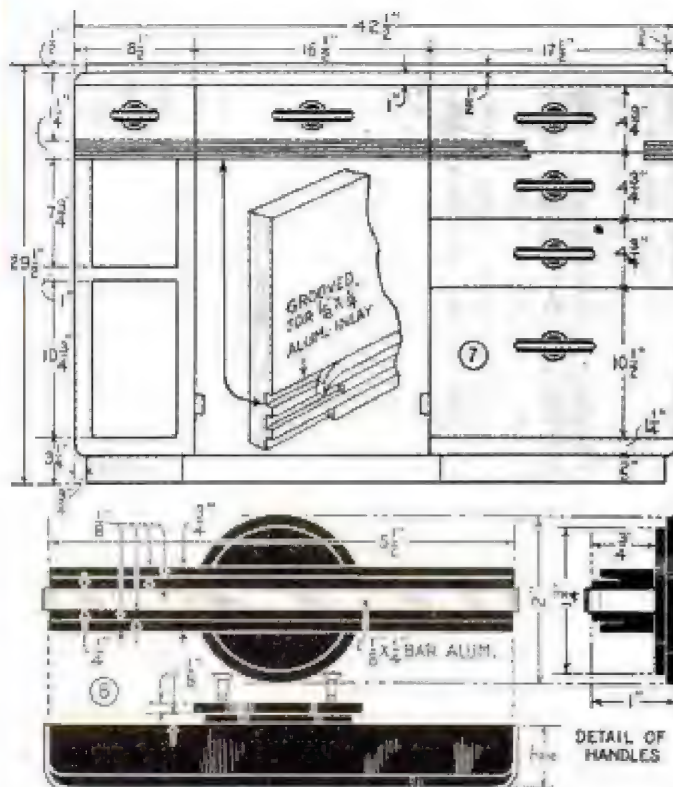
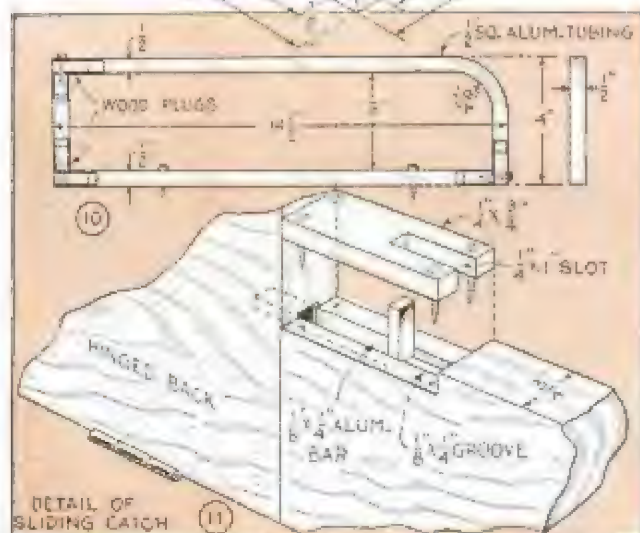
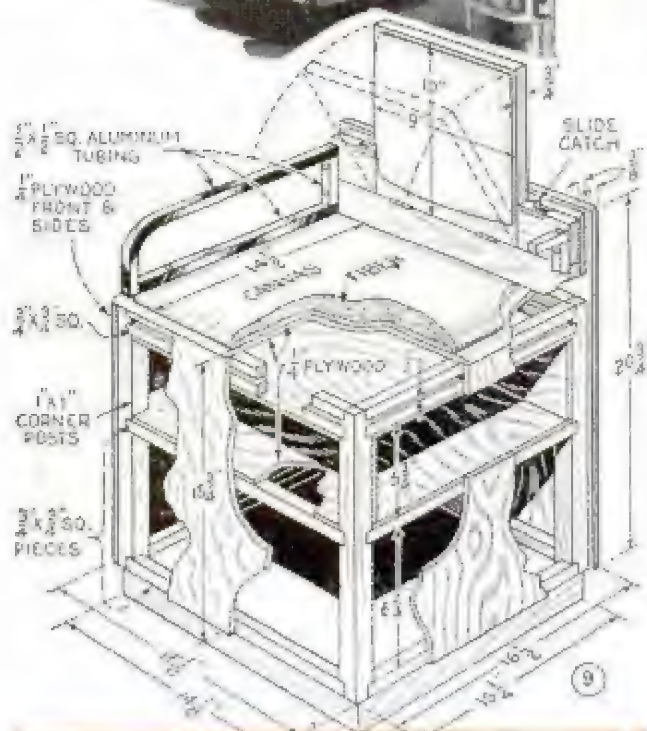
Steel Sales Corp. 129 St

get ready to do this be sure first to rough the glue side of the aluminum with a coarse file and use casein glue. The center drawer is fitted with pen, pencil and paper-clip compartments, and the large bottom drawer with an inclined slide for files. With the right-hand drawers in place in the desk, the bottom strip is nailed and glued in position. The last step prior to covering the frame with plywood panels is to insert the false back for the hidden compartment and the bottoms of the book cabinets, as in Figs. 3, 4 and 5. With this done, you can nail on the sides and back and screw the $\frac{1}{2}$ -in. sub-top in position. Next comes the rounding of the top and bottom edges. These are first planed to shape and finished with fine sandpaper. The $\frac{1}{4}$ -in. top is then nailed in place on the sub-top and covered with a sheet of felt, after which the $\frac{1}{2}$ -in. aluminum angle is mitered, drilled and polished. Enamel the double-thick glass top with jade green on the underside, first carefully cleaning the side to be enameled. Now, with the enameled side to the felt, screw on the aluminum frame as in Fig. 3. This frame should be removed before painting and replaced when dry. Cut the handles to shape, round the ends and rout for the aluminum inlays as shown in Figs. 7 and 8. These inlays are bent to form a spring fit and are glued in position, first roughening the inside. Drill and tap the handles and disks to accommodate the machine screws which hold them to the drawer fronts.

The same procedure is followed for the chair as for the desk. The back and seat are padded with fiber and covered with canvas enameled jade green color. These were made on $\frac{1}{4}$ -in. plywood bases and screwed on from the underside. See Fig. 9. The slide catches for the chair back were made as in Fig. 11, from scraps of the aluminum bar used for the inlays. Sliding casters are next fitted to the bases



at each corner and the latter screwed in place. When assembled, the entire job is rubbed down to a smooth finish and a filler is added. Following this an undercoat was put on and over this two coats of enamel,



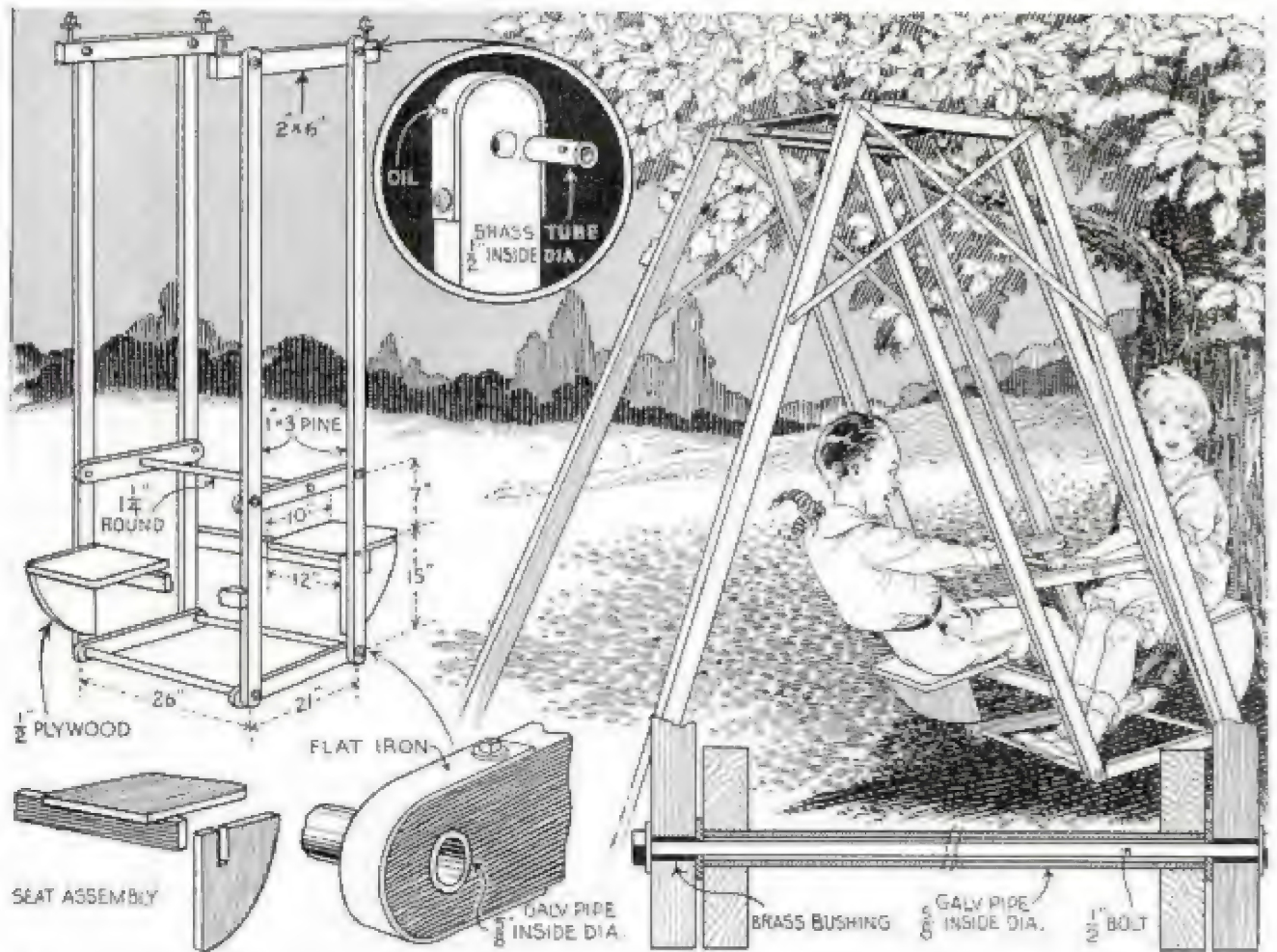
rubbing down between each coat. The last step is the bending and assembling of the aluminum chair arms, Fig. 10. These are made of $\frac{1}{2}$ -in. square aluminum tubing and should be drilled and polished first before bending. To bend the tube, fill with dry sand, plug the ends and bend around a circular form of the required diameter. After bending, empty the sand, again plugging the ends tightly to hold the screws. Assemble and screw firmly in position on the chair. Fig. 1 and the illustration directly above show how the chair slides into the knee hole of the desk.

Holes in Garden Sprinkling Can Kept from Clogging

When some chemicals are mixed with water to be used in a garden sprinkler, undissolved particles often accumulate in the cap and clog the perforations. If a piece of screen wire is rolled into a cone of several thicknesses, and inserted in the spout, undissolved crystals or pieces of foreign matter will not reach the perforations.



This Pantograph Swing Has Tete-a-Tete Seats



Designed so that the two passengers face one another on offset seats, this swing is put into motion when one passenger pushes with the feet and pulls with the hands while the other passenger repeats the operation for the return swing. All framing is 1 by 3-in. pine or spruce, the ends of which are rounded and bound with light flat iron to prevent splitting. Bear-

ings are fitted with brass bushings through which oil holes are drilled to lubricate them. The foot bars or lower cross members are long bolts inside pipe spacers, while the upper cross member or handlebar is a length of round wood. The swing can be suspended from parallel pieces of 2 by 6-in. stock bolted to a porch ceiling, or it can be supported on a lawn frame.

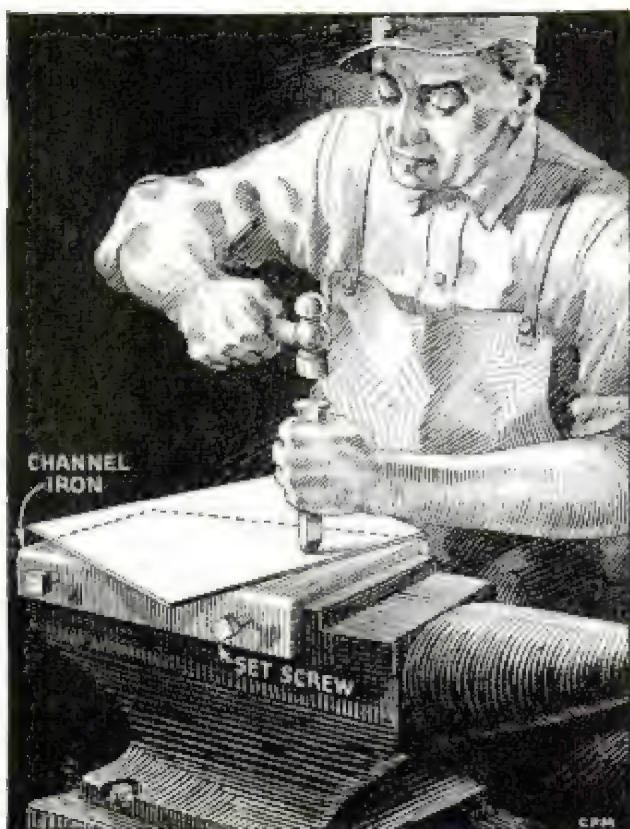
Removable Handle to Carry Heavy Trunks and Toolboxes

For carrying trunks, toolboxes and similar articles that have grips on the ends this removable handle enables you to use both hands to keep the load on your back. Bent to the shape indicated, from a length of small pipe or iron rod, the handle is bolted or riveted to a piece of heavy flat steel, bent to slip under one of the grips. Sponge rubber or other padding is cemented to the back of the steel piece.

Sealing wax is good for covering up exposed metal on chipped photo trays.



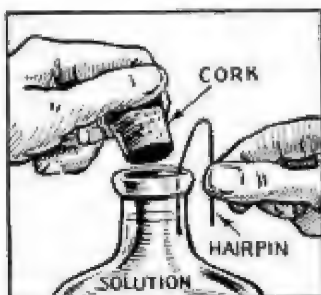
Anvil Has Removable Shield to Use Cold Chisel



Surface of anvil protected if this shield is used when cutting sheet metal with a cold chisel

Here is a shield that you can put on an anvil so that it can be used to support sheet metal while cutting it with a cold chisel. The shield is a length of channel iron of a size to slip over the top surface of the anvil snugly. Two holes are drilled and tapped in one side of the shield for set screws, which hold it in place.

Bottles of Developing Solution Corked Tightly



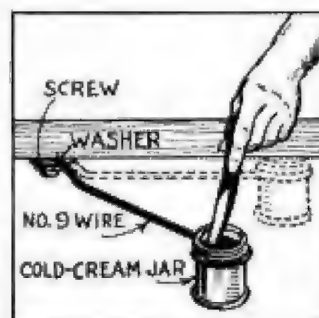
As it is necessary to exclude all air from corked bottles of photo-developing solutions, the job of inserting the stopper, and at the same time excluding all air, can be accomplished quite easily by use of a hairpin. To do this fill the bottle well up into the neck, then hold a hairpin inside the mouth as indicated, and insert the cork. The hairpin, which is re-

moved after inserting the cork, allows the air to escape, leaving the interior entirely air tight.—S. L. Sameth, New York, N. Y.

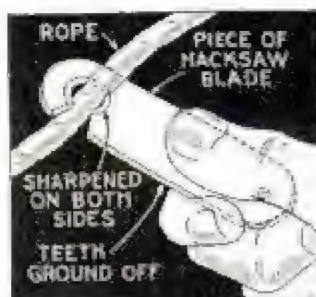
Container for Soldering Flux Swings under Bench

Kept in a container attached to a pivoted arm, which swings under your workbench top, soldering flux is always at hand when needed, yet is not likely to be spilled accidentally. The container can be a small cold-cream jar or similar vessel with a length of No. 9 wire wrapped around it under the rim at the top and pivoted to the bench with a bolt and washer.

—Chas. B. Kramer, Michigan City, Ind.



Pocket Twine and Cord Cutter from Hacksaw Blade

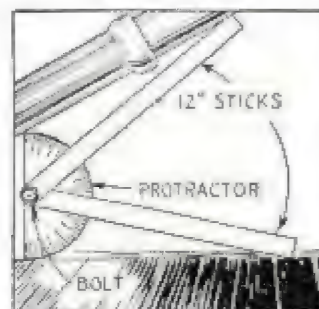


Always at hand if carried on your key ring, this simple twine cutter is merely a piece cut from the end of a hacksaw blade. Grind in from one side of the blade to the regular hole,

forming a "V" as shown. Next, sharpen the surface of the hole and remove the teeth, after which the edges are rounded.

Protractor for Long Angles

When it is necessary to measure a wide or long angle, and no protractor is at hand, this improvised one will do the job. It is made by bolting two 12-in. strips of wood to an ordinary ten-cent protractor which can be obtained at a dime store.

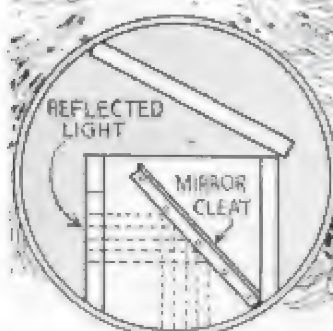


FISH POOL

protected against

WINTER

STRAW BEDDING AND
TARPAULIN OVER WOOD COVER



HOOD FOR LIGHT AND FEEDING

"Tailored overcoat"
shelters fish and
protects the pool
from arctic blasts

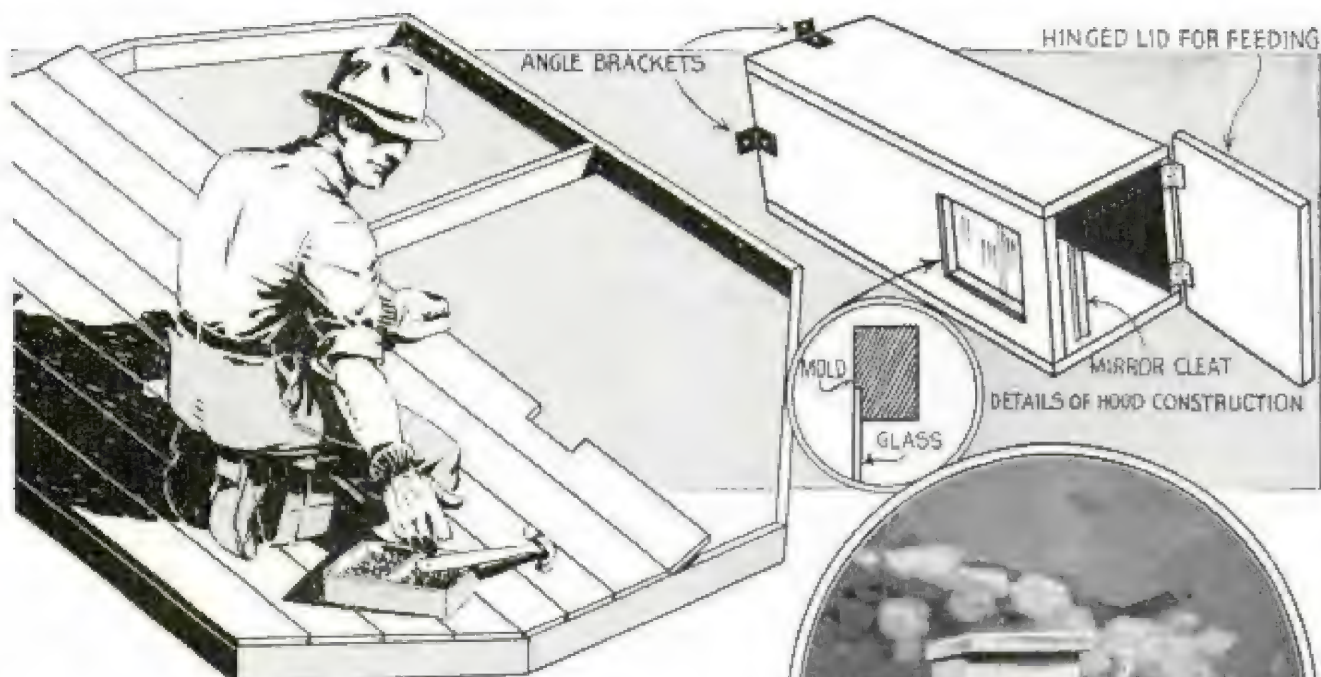
By
WAYNE C. LECKEY



KEEPING fish in your garden pool the year 'round is a comparatively simple task to undertake and saves considerable time otherwise spent each season in transferring and housing the stock indoors. The pool is thus in readiness when spring arrives without need of disturbing it or restocking with fish and plant life.

At the first signs of fall you should start preparing the pool for the winter season. A satisfactory method for protecting a rather large pool from freezing solid consists of covering it with a wooden platform to fit, on which is placed a thick bedding of straw and a tarpaulin, weighted with

stones to prevent the straw from being blown away. Besides protecting the fish, such a covering will also prevent the pool itself from being damaged by the heaving action of the ground when it freezes. The platform can be stored from season to season. For a small pool, it can be made as one unit; sometimes even a discarded door will do. But where a rather large area is to be covered, the platform should be made up in several sections for convenience in handling and storing. In making it, the general shape of the pool is kept in mind to allow it to rest firmly on the stone edge. Should the pool be round or oval,

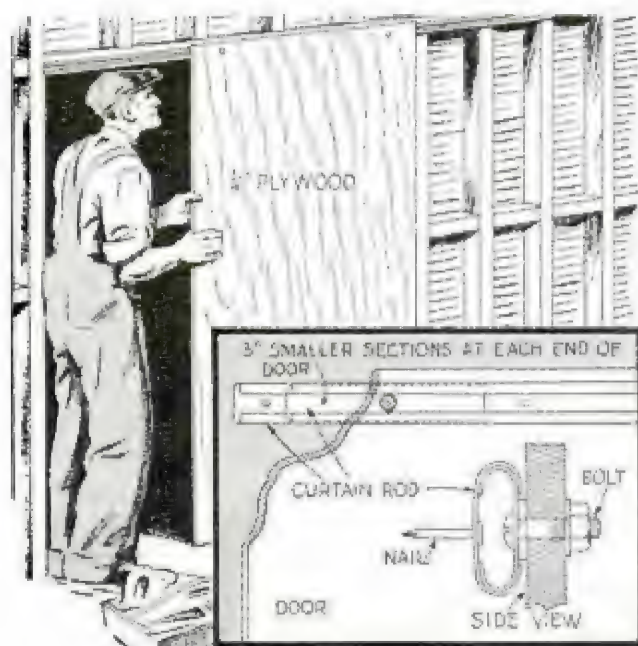


the platform can be made in octagon shape as shown. A most serviceable platform is one having a 2 by 4-in. framework sheathed with matched flooring.

Openings in the platform should be provided, and hooded "skylights" are erected over them to admit light to the interior and to provide facilities for feeding the fish. One is adequate for a small pool while two or more should be used over a wide area. These should be made to extend sufficiently high above the platform so they will not be covered by the bedding, and they are provided with windows near the top to admit light. A small mirror fit-

ted inside at a 45° angle as shown will reflect the light into the interior. For bedding, straw and leaves can be used. A thick layer is applied over the platform. The addition of green stable manure to the bedding will aid greatly in producing warmth in case the winters are extremely cold.

Curtain Rod Used as Track for Lightweight Sliding Doors



Flat, telescoping curtain rods are serviceable as tracks for light sliding doors. Lubricated with a little oil, a track of this type will permit a door to slide with surprising ease. The idea was applied to a 4 by 6-ft. plywood door, closing off attic space, where rafters prevented the installation of a swinging door. In this case an 8-ft. track was used, consisting of three curtain rods from which the curved ends were removed. For slides, two 3-in. pieces of the inner rod were bolted to the door, a spacer washer keeping the door free from the track. The slides were located near the ends of the door and as only one bolt was used for each slide, the slight play prevented binding. If more than one section of track is required, adjacent ends can be

held in alinement with the slides before the latter are attached to the door. The track is best held in place with small flat-head brass screws, driven flush with the inner surface of the track, which will prevent the slides from catching.

—E. R. Gaskill, Royal Oak, Mich.

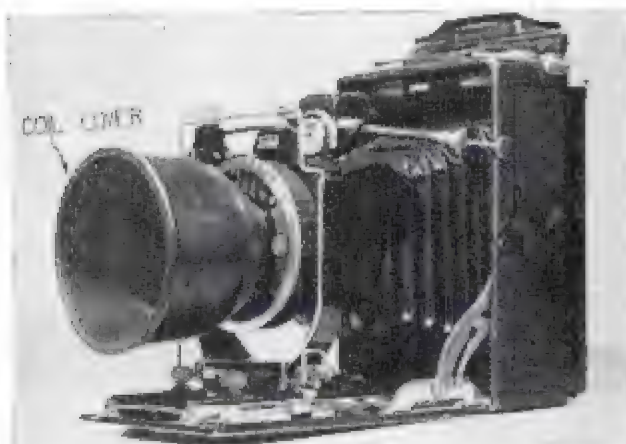
Swing Padded to Prevent Injury



If you have a swing for your child and several other children play with it, it's a good idea to pad the front edge to prevent any possibility of one of the children being injured, should they be accidentally hit on the head. The pad is merely a piece of fabric or inner tube stuffed with cotton and nailed to the edge of the seat.

Inexpensive Camera Lens Hood

If you need a lens hood for your camera, one can be made in a jiffy from a rubber cover used on automobile ignition coils. These covers can be obtained from any auto accessory store, and are fitted to your camera by enlarging the small end so that

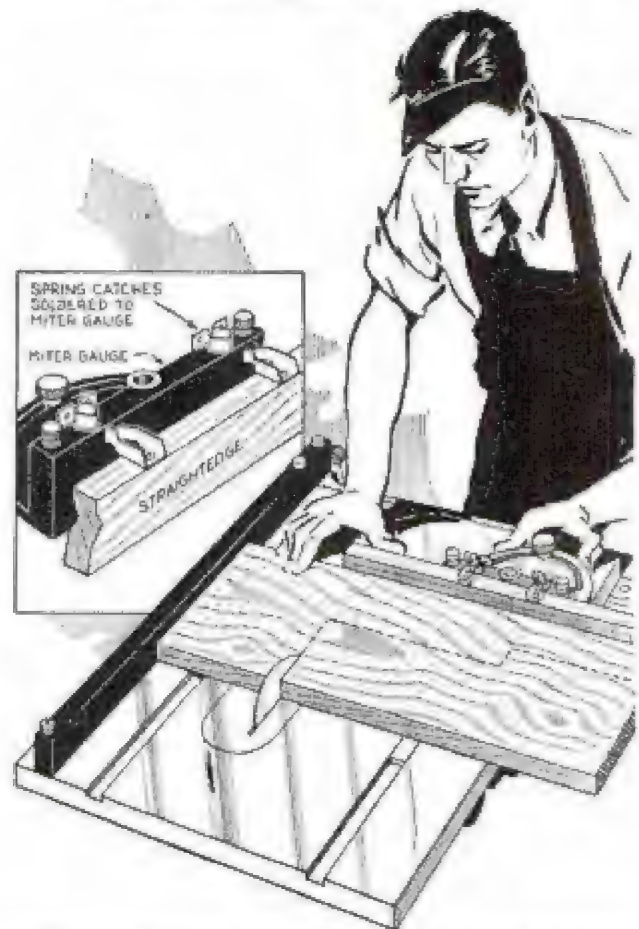


Long-lasting, flexible hoods for camera lens quickly made from rubber ignition coil covers

it will slip tightly over the rim of the lenses. The rubber hoods to some gear-shift levers can also be used for this purpose. Such camera lens hoods are flexible, long lasting and easy to carry in your bag or camera case.

—Larry J. Fisher, Beaumont, Tex.

Straightedge on Saw Miter Gauge Is Changed Quickly



Quickly removed, this miter-gauge straightedge is attached by means of spring cabinet catches

Instead of wasting time to screw a block to the miter gauge of his circular saw every time the work required it, one home-shop worker provided a permanent straightedge which could be snapped on or off the gauge. As shown, half of a spring catch is spotted to the top of the gauge by brazing, and the corresponding half is screwed to the straightedge.

Chisels Protected against Rust in Oil-Soaked Glove

To keep his turning chisels and similar tools from rusting when not in use, one home workshop owner inserts them inside of a glove which is soaked in oil. The glove is either kept in a drawer or hung on a wall.





FRAME *that*

MOLDINGS for picture frames can be purchased in a wide variety of shapes at reasonable cost, or the craftsman can make his own on the shaper or drill press. After the molding has been obtained, the first operation is to miter the four pieces required to exact lengths and to an exact 45 degrees. This operation can be done with a hand saw and miter box, or the cuts can be made in the usual manner on the circular saw, as shown in Fig. 3. In any case, the joint should be checked on scrap wood first to make certain of a clean fit.

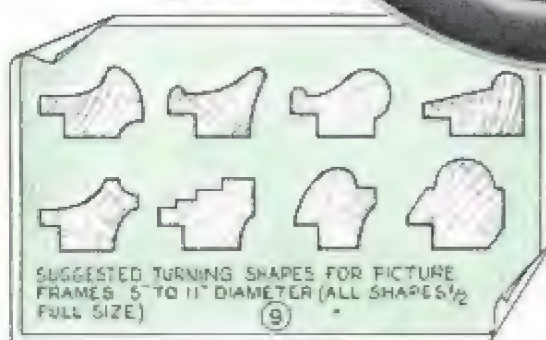
Each of the four joints is now drilled, using a small hand drill, as shown in Fig. 2. Notice, here, the



simple backing block which is used to hold the pieces in proper alignment. Since the joint will slide slightly on being nailed, the upper piece should be offset about $\frac{1}{8}$ in. while the hole is being drilled, as shown in Fig. 5. A dab of glue is then applied to each joint in turn, as in Fig. 4. The glue should

Picture

not be spread over the whole surface of the joint, but should be confined to the center area so that it will not be squeezed out when the joint is fitted together. Each of the two pairs are now nailed together, using the same backing block as before, after which the two pairs are nailed together to form the complete frame. Small box nails should be used; finishing nails, while neater,

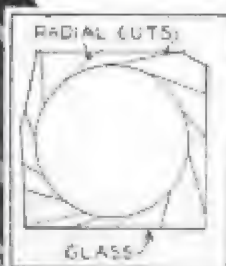
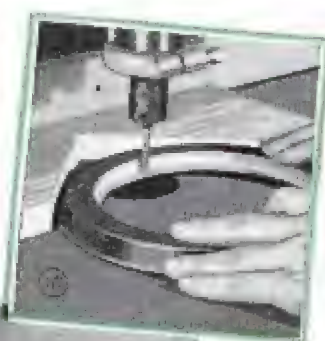
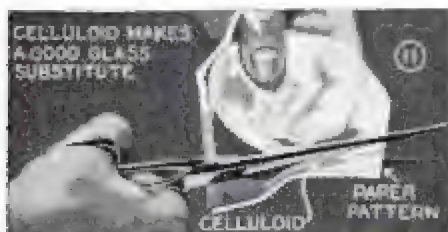


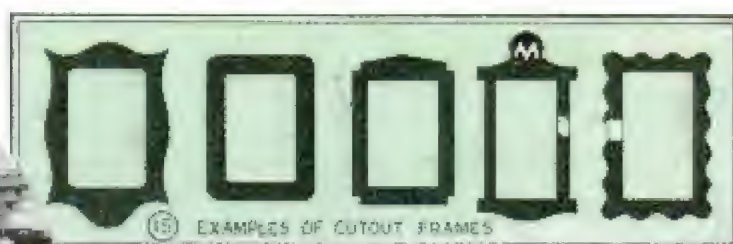
do not have sufficient head to pull the joint tight. After nailing, the frame is placed on a flat surface and leveled by giving

it a few light mallet taps, as shown in Fig. 6.

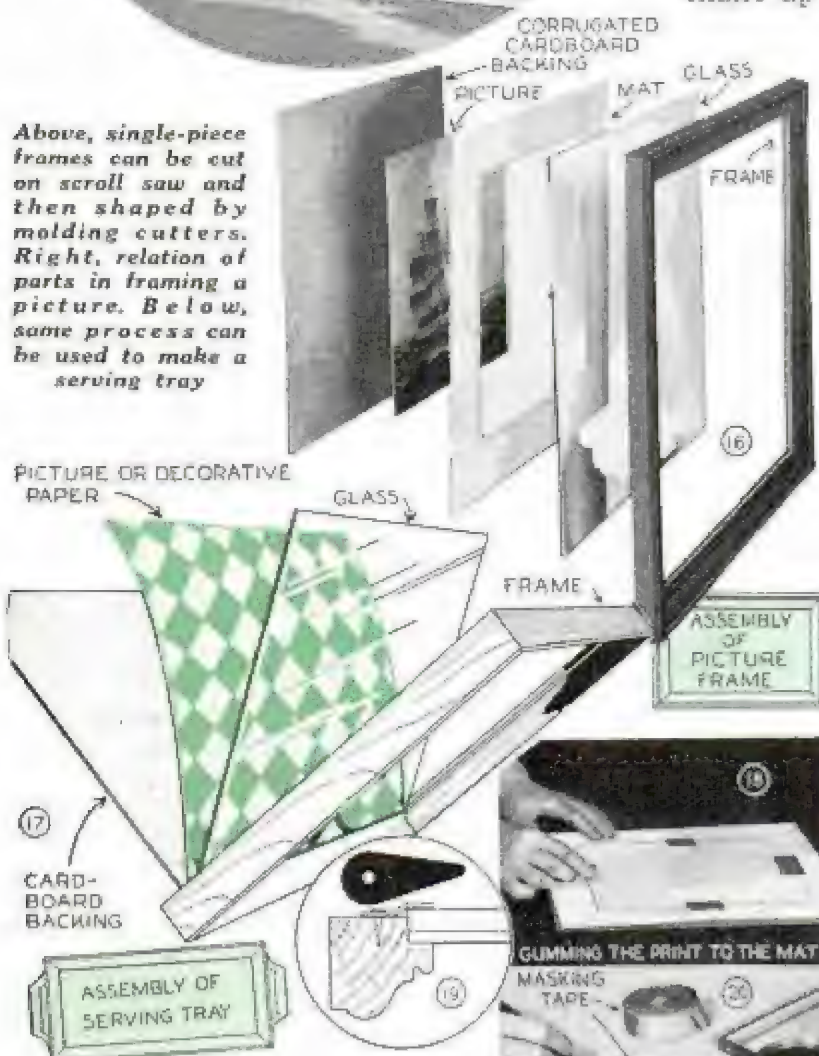
Tighter joints can generally be secured if some form of miter clamp is used. One of the simplest styles for homework is shown in Fig. 1. The frame is glued up and assembled on any flat sur-

face, then the four corner blocks are fitted in place and held by means of two turns of heavy cord. Small pieces of wood are inserted between the cords at each side and twisted until the frame is tightly clamped in the required position. An efficient yet simple miter clamp is shown in Fig. 7. Made to the dimensions given, it will accommodate any average-size picture. The center or tightening bolt can be eliminated in favor of any parallel clamp which will serve the same purpose of drawing the two halves together. Any frame assembled by gluing and clamping can later be nailed or bradded together to strengthen





Above, single-piece frames can be cut on scroll saw and then shaped by molding cutters. Right, relation of parts in framing a picture. Below, same process can be used to make a serving tray



the joints further. Round frames are attractive, and are easily turned on the lathe, as in Fig. 8, or worked on the shaper or drill press, as in Fig. 10, after band-sawing. Some typical shapes are shown in Fig. 9. The best method of making round frames is

to work them in the lathe. The glass rabbet is turned first, after which the center of the turning can be sawed out and the ring fitted tightly over a wood chuck to permit turning the face and rim. Miniature frames cut from plastic cylinders and turned to shape on the lathe, as in Fig. 12, make up effectively for small prints.

Glass should be single strength. Straight cuts are easily made with any ten-cent glass cutter. Circles can be cut with a circular glass cutter, or, lacking this, by the simple method shown in Fig. 13. A wood block is first mounted on the lathe spindle, and the size of the required circle is marked. The glass is then placed against the wood and held there by means of two or three tacks. Now, if the glass cutter is held against the glass and the lathe turned by hand, the cutter will mark the circular shape required. After the center cut has been made, radial cuts from the circle to the edge are made, permitting the outer portions to be broken off. Sheet celluloid can be used to advantage as a glass substitute for small frames. The celluloid is lightly pasted to a sheet of paper on which is marked the circle size. Cutting is done with a pair of scissors, as in Fig. 11. Frames cut from solid stock on the scroll saw and shaped on the drill press as in Fig. 14, are very effective in small sizes. A few typical styles are shown in Fig. 15.

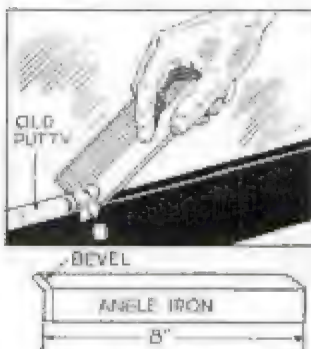
After the frame has been made, the various parts are assembled. The general arrangement is shown in Fig.



16. Mats can be cut from white or tinted paper or cardboard, and are useful in setting off and lending importance to small prints. Original oil paintings and reproductions of oils are framed without mats or glass. All other kinds of pictures can use mats to good advantage, although they are not necessary. The print can be fastened to the back of the mat with short lengths of gummed tape, Fig. 18, or the print can be touched with a few dabs of paste and applied to the cardboard backing. If desired, the mat can be painted on the back side of the glass, Fig. 20, masking the area not to be painted with gummed or masking tape. The final step is nailing the cardboard backing in place, as in Fig. 21. Small brads are ordinarily used, although phonograph needles or glaziers' points work equally well. In some cases, the backing will extend beyond the frame rabbet, and in this case must be held in place with small metal lugs, as shown in Fig. 19. High-class work usually has a sheet of brown wrapping paper pasted over the entire back of the frame to act as a sealer, but this is seldom applied to the average run of pictures.

Serving trays are closely allied to picture frames in the general method of construction and assembly, as evident from Fig. 17, the only great difference being the substitution of decorative paper, in some cases, for the usual picture.

Angle-Iron Putty Remover



The job of removing old putty from a window sash is easier with a piece of small angle iron beveled to a sharp edge at one end than it is with a putty knife. When using the latter, a prying effect must be exerted against either the glass or wood which tends to chip off the putty, leaving small pieces adhering to the sash. With the sharpened angle iron, there is a shearing action and pressure is equal against the glass and wood. When using the angle iron, slightly twist it from side to side as you push it steadily forward.

Checkers Have Non-Skid Bases to Play on Train

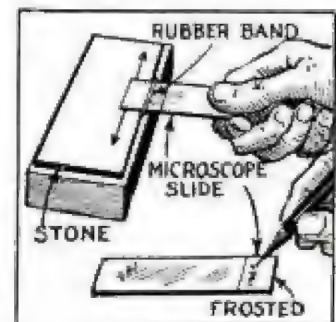


These checkers will not slide around on the board when playing on a train or other moving vehicle

If you and your friends like to play checkers when riding on a train, or even in an auto trailer, it's an easy matter to cement rubber disks to the bottom of the checkers to keep them from sliding on the board. Disks cut from an old inner tube are ideal for the purpose, and they can be attached with rubber cement. Apply cement to both the disk and the checker, let it dry and then apply a second coat. When this is almost dry, put the disk in place.

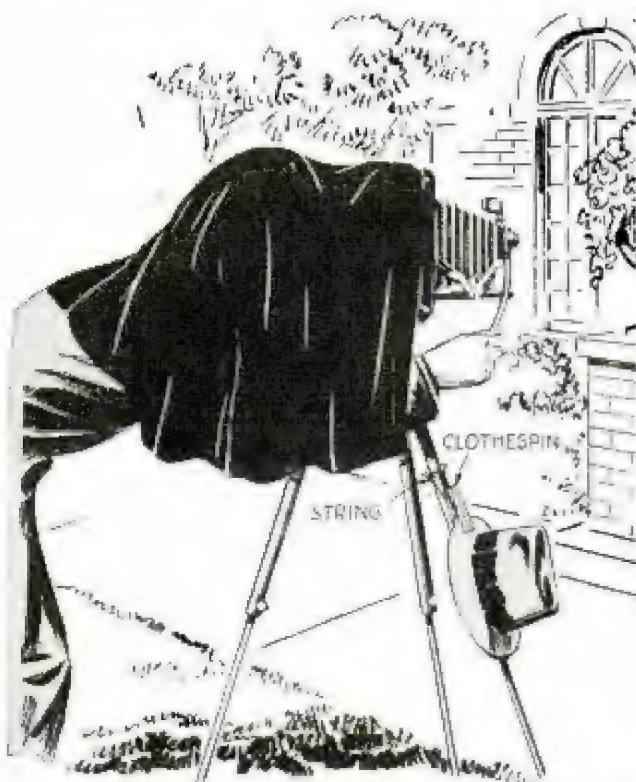
End of Glass Microscope Slide Frosted for Writing Data

If one end of a microscope slide is frosted by rubbing it carefully over a wet abrasive stone, you will have a place on the slide to record data with a lead pencil. A rubber band stretched around the slide will serve as a guide in getting the outline of the frosted section even. The writing on the frosted part of the glass can be removed with an ordinary pencil eraser.



—R. Wailes, Bethesda, Md.

Clothespin on Camera Tripod Holds Photographer's Hat

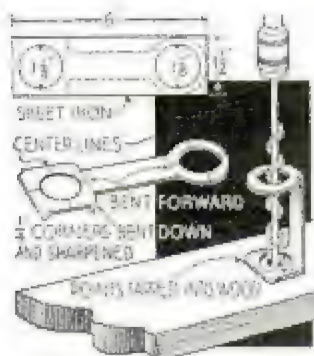


When using a focusing cloth, just clip your hat under a spring-type clothespin fastened to the tripod

Lashed to one leg of a camera tripod, a spring-type clothespin makes a good holder for the photographer's hat while using a focusing cloth outdoors. If placed on the outside of the leg, the clothespin will not interfere when folding the tripod.

Guide Holds Auger Bit to Bore True Holes

Boring straight holes in wood is easy if you use this simple guide. It is made from



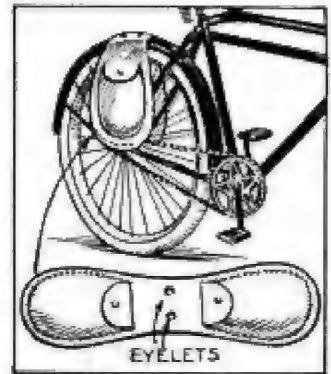
a piece of sheet iron cut and bent to the shape indicated. One end should be square so that the corners can be sharpened and bent down to stick into the work to hold the guide in place. It's a good idea to make a

chisel mark on each side of the lower hole to help in centering the bit. While this guide is for use only on rough work where a little marring of the surface is not ob-

jectionable, one for finished work can be made by eliminating the turned-down corners of the lower part and cutting it long enough to extend to the edge of the work so that a C-clamp can be used to hold the guide in place.

"Saddle Bags" on Your Bicycle

These "saddle bags" are just the thing for short bicycle trips. Straddling the rear mudguard to which they are fastened, it's an easy matter to attach or remove them instantly as eyelets in the

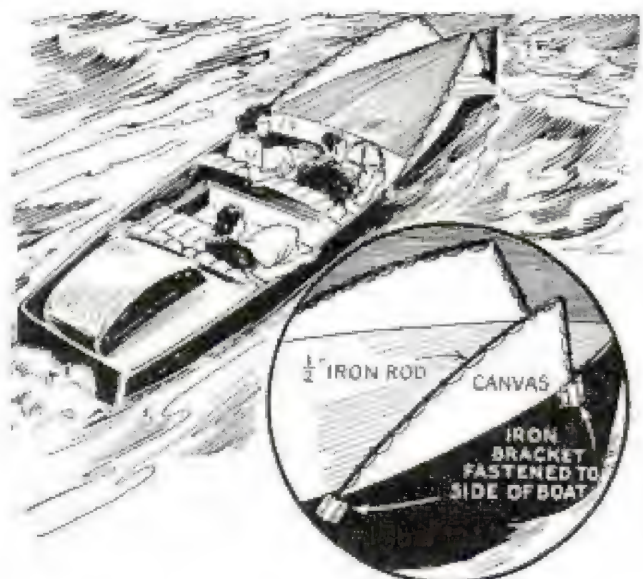


leather fit over small lugs on the mudguard. Any heavy, waterproof material such as leather or canvas can be used.

Boat Wings Protect Passengers Against Water Spray

Mounted along the sides of a motorboat near the bow, canvas wings deflect spray, which often drenches the passengers on windy days. The wings are shaped from 1/4-in. iron rods, which have canvas stretched over them, they are removable and slip into brackets screwed to the side of the boat at the gunwale.

—Bob Poulson, Los Angeles, Calif.



These wings deflect water spray that comes over the bow of a motorboat in rough weather

Automatic HUMIDIFIER

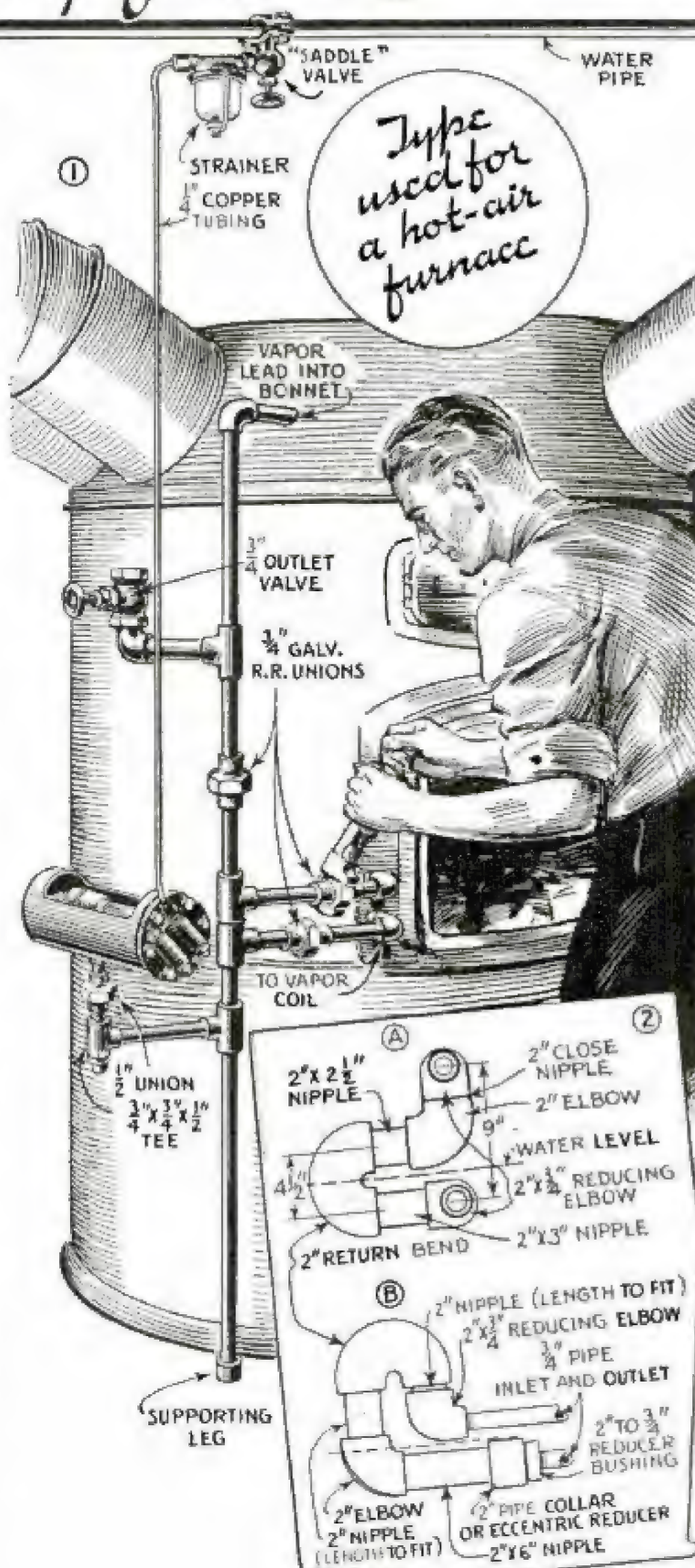
fits any furnace

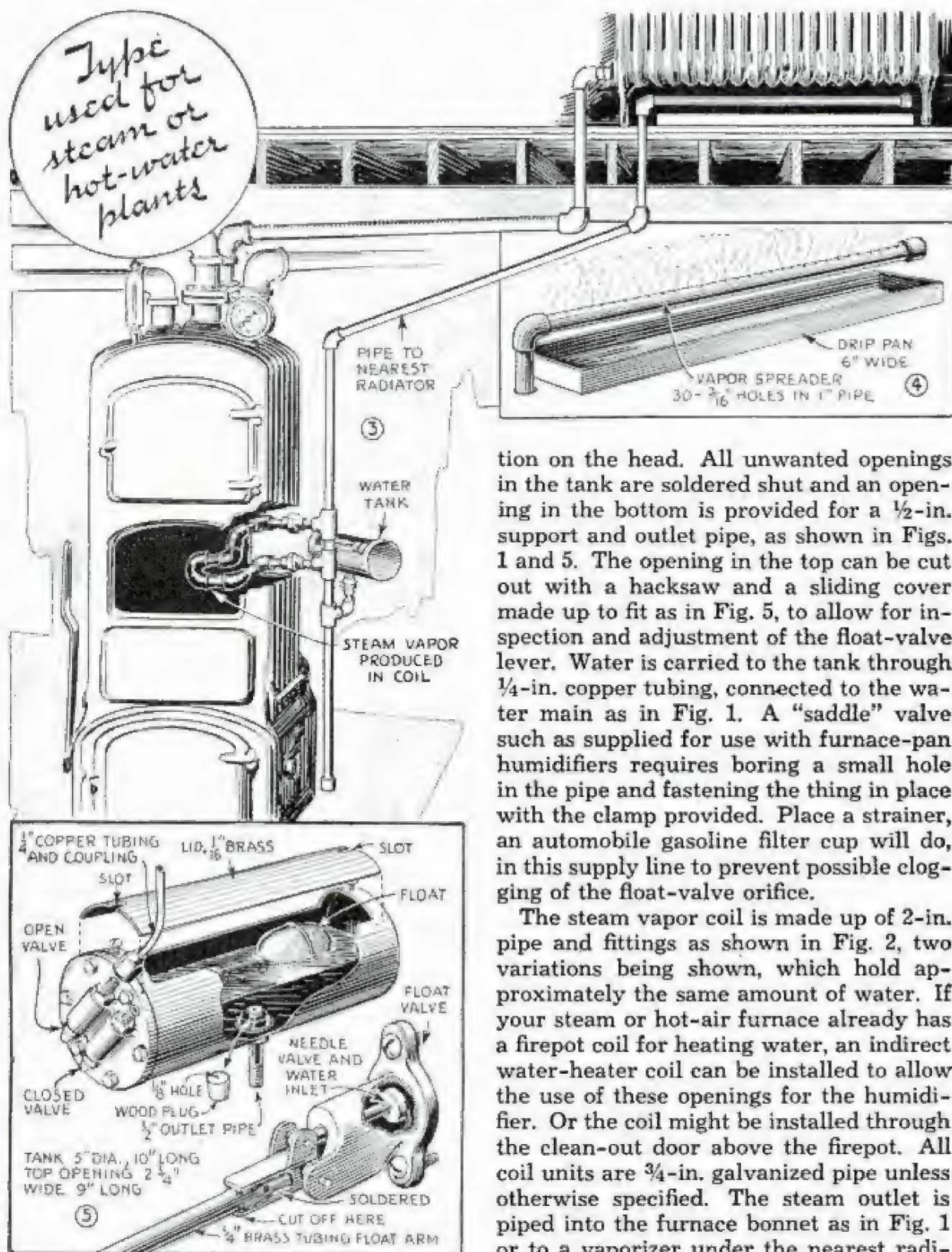
Every home needs moisture added to dry air during the winter months—for health and protection of furniture

By A. L. MILLS

BY SUPPLYING the air in your home with sufficient moisture you can carry a somewhat lower temperature and still feel comfortable. The furniture will be safeguarded against shrinkage and checking caused by dry air, and coughs and colds will be noticeably lessened where the humidity is maintained at the proper level. Since furnace and radiator pans are often inadequate or neglected, this simple, automatic humidifier fills the need without motors, fans or expensive ducts. Vapor is produced in a steam coil in the furnace according to the amount of heat in the firepot. Average winter temperatures usually require the evaporation of 6 to 10 gals. of water per day in a six-room house to keep the humidity from falling below 30 per cent when the outside temperature is zero and the inside 70 degrees. The two types of humidifiers shown here have been found adequate for a six-room house of medium size.

The water level in the vaporizing coil, Fig. 2 A and B, is kept constant through a float valve and supply tank outside the furnace. The float valve and tank from several standard electric refrigerators can be used here with slight changes, or the standard furnace-pan valve may be fitted to a suit-





able tank. The refrigerator tanks are readily available from refrigerator repair shops. It is advisable to get the type with a detachable float valve such as shown in Fig. 5, so that the valve can be placed above the water line by reversing its posi-

tion on the head. All unwanted openings in the tank are soldered shut and an opening in the bottom is provided for a 1/2-in. support and outlet pipe, as shown in Figs. 1 and 5. The opening in the top can be cut out with a hacksaw and a sliding cover made up to fit as in Fig. 5, to allow for inspection and adjustment of the float-valve lever. Water is carried to the tank through 1/4-in. copper tubing, connected to the water main as in Fig. 1. A "saddle" valve such as supplied for use with furnace-pan humidifiers requires boring a small hole in the pipe and fastening the thing in place with the clamp provided. Place a strainer, an automobile gasoline filter cup will do, in this supply line to prevent possible clogging of the float-valve orifice.

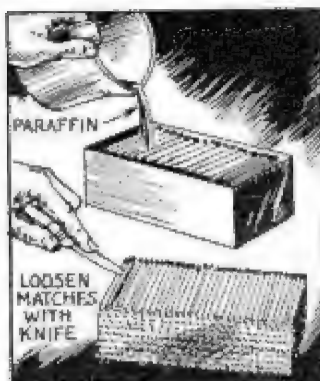
The steam vapor coil is made up of 2-in. pipe and fittings as shown in Fig. 2, two variations being shown, which hold approximately the same amount of water. If your steam or hot-air furnace already has a firepot coil for heating water, an indirect water-heater coil can be installed to allow the use of these openings for the humidifier. Or the coil might be installed through the clean-out door above the firepot. All coil units are 3/4-in. galvanized pipe unless otherwise specified. The steam outlet is piped into the furnace bonnet as in Fig. 1 or to a vaporizer under the nearest radiator as in Figs. 3 and 4. In the latter case the pipe should slope back toward the boiler to return the condensed moisture. Since the vapor quickly spreads through the whole house it only should be necessary to have the outlet under the nearest radiator; in some installations it might be

necessary to have two outlets. A shallow galvanized pan 6 in. wide can be placed under the vapor outlet pipe as in Fig. 4 to catch any small amount of moisture formed while the radiator is cold. None will form when it is warm.

A humidity indicator should be provided to assist in balancing the amount of vapor with local conditions. Adjustment is obtained by by-passing part of the steam, changing the amount of water in the coil, or by shifting the position of the coil in the firepot. If you have a stoker or oil burner any excess steam can be piped into the blower intake where it will be blown into the firepot to promote better combustion. Where the water supply is excessively hard, a gravity tank for rain water can be provided, or the supply can be run through one of the inexpensive portable water softeners, to avoid a lime deposit in the coil. Do not overlook placing the $\frac{1}{8}$ -in. reducing plug in the water outlet on the tank as this is necessary to avoid sudden surges of water into and out of the supply tank and consequent "hammering." See Fig. 5. Fill the coil with water very slowly and only when the furnace is thoroughly cooled, to avoid possible damage to the coil or furnace.

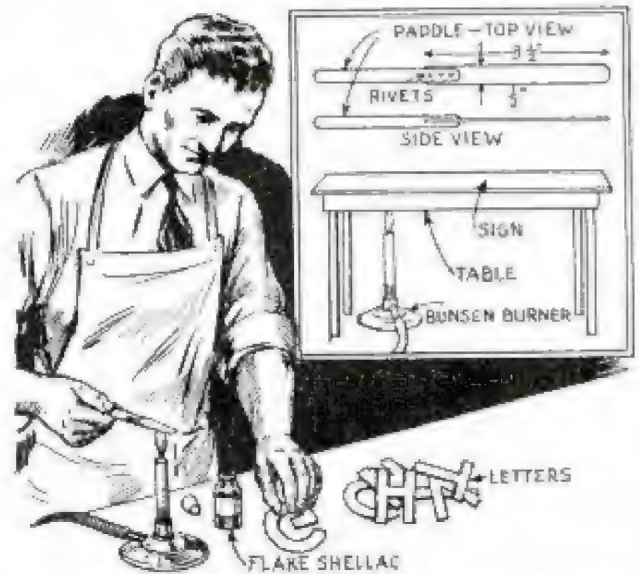
Paraffin Keeps Matches Dry

One of the easiest ways of keeping matches dry on a camping trip is to take a box of regular kitchen matches, remove the top of the cover and pour melted paraffin directly into the box, pushing the matches down into a compact mass as the paraffin begins to harden. Of course, it must not be so hot that the matches will be ignited. When the paraffin has hardened, tear away the box, after which the matches are removed with the point of a knife blade as needed.



❏ Mold will not form on tops of jelly and preserve jars if a bowl of lime is placed in the closet where they are stored.

Letters on Sign Changed Quickly by Applying Heat on Back

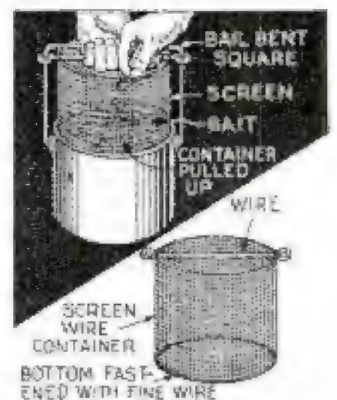


Letters shellacked to background of sign are quickly changed by applying heat to melt the shellac

If you have need of a sign, one can be made easily by sawing the letters from wood and fastening them to a sheet-metal background with shellac, which is melted and applied to the letters with a paddle. Then, when you want to change the message on the sign, just hold a blowtorch against the background to soften the shellac and you can change the lettering in a jiffy.—Joseph L. Horton, Cleveland, O.

Minnow Pail With Screen Cage Permits Catching Bait Easily

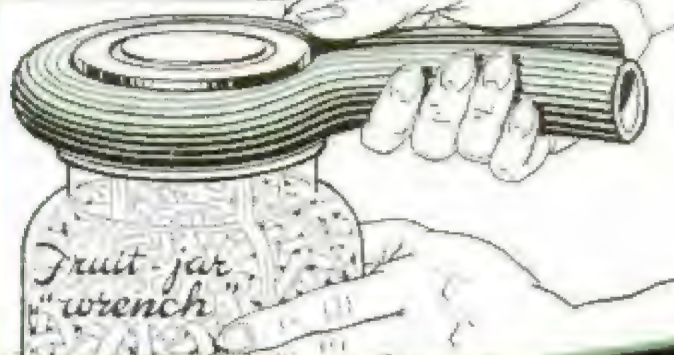
The job of catching live bait in a minnow pail is made easy by using this double one. All that is necessary is to make a cage of common window screen to fit inside the pail. A piece of wire is run horizontally through the center of the cage near the top, after which loops on each end are closed around the bail, this being bent to a U-shape as shown. In use, grasp both bail and cross wire at the same time, to lift the cage out of the water for easy access to live bait.



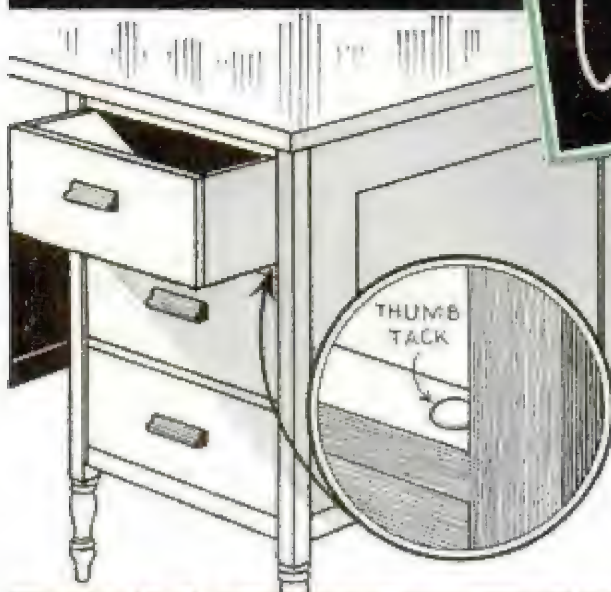


You can get a good grip on screw tops of glass jars with this homemade "wrench." It's best to use two of them, one around the top and the second around the jar itself

GARDEN HOSE
PARTLY CUT AWAY

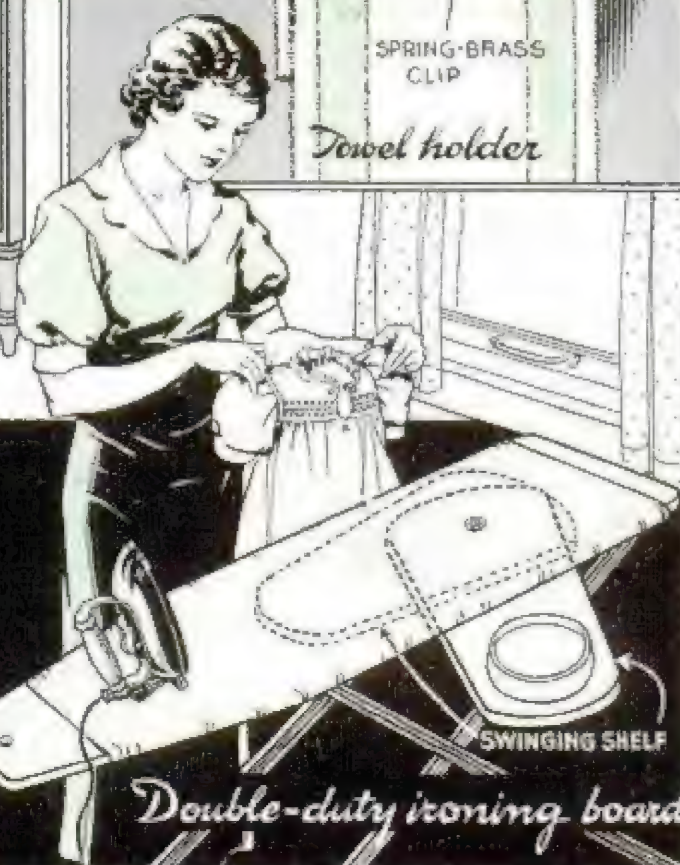


Above, although steel wool is most effective in scouring kitchen utensils it is apt to injure the hands. To make a safe holder, cut a circular section from a hollow rubber ball and pack the wool into the opening, leaving only a small portion exposed, as shown



THUMB
TACK

EASY WAYS for HOME



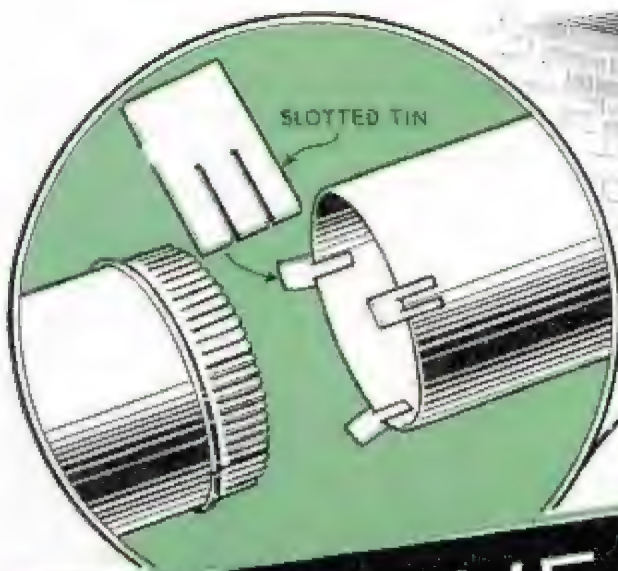
SPRING-BRASS
CLIP

Towel holder

SWINGING SHELF

Double-duty ironing board

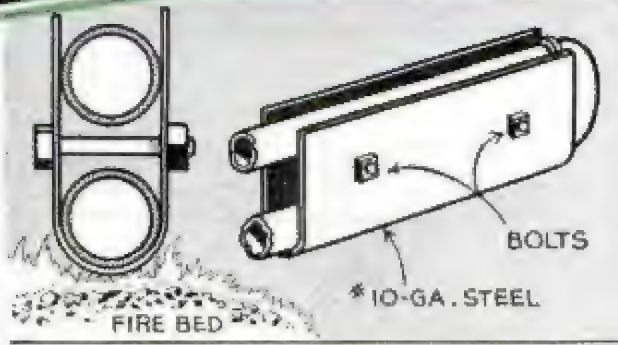
Above, to make hard-sliding drawers work easily, drive a thumbtack into the rail at each side of the opening so that the lower edges of the drawer sides bear on the tacks. Upper right, a U-shaped clip cut from spring brass will keep towels from slipping off the rack onto the floor. Right, a swinging shelf attached to the underside of a folding ironing board is always handy for holding a pan of water for sprinkling or supporting a portion of a large garment. The bolt holding the shelf is countersunk below the ironing surface



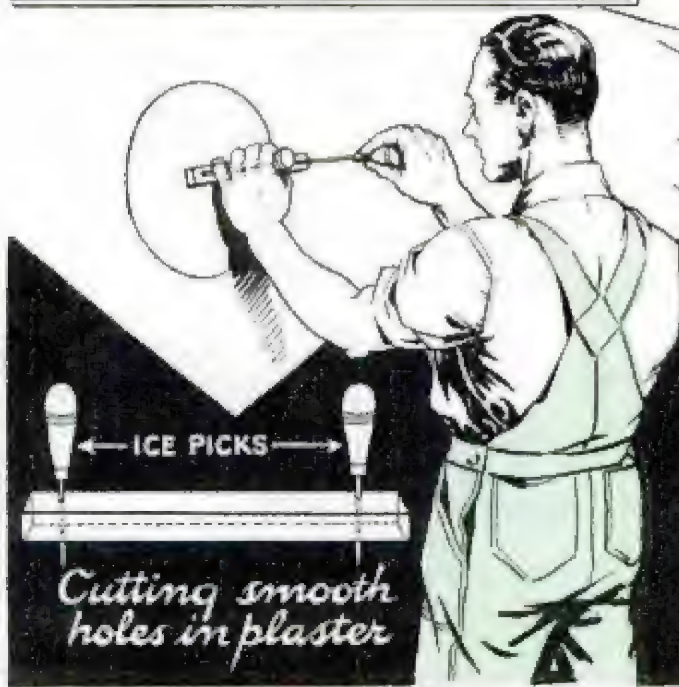
Tin clips join furnace pipe

TO SOLVE PROBLEMS

The next time you have to put up stove or furnace pipe singlehanded you can avoid a lot of trouble by using several tin clips or guides as shown above. After the pipe is joined the guides can be removed easily and saved for the next job

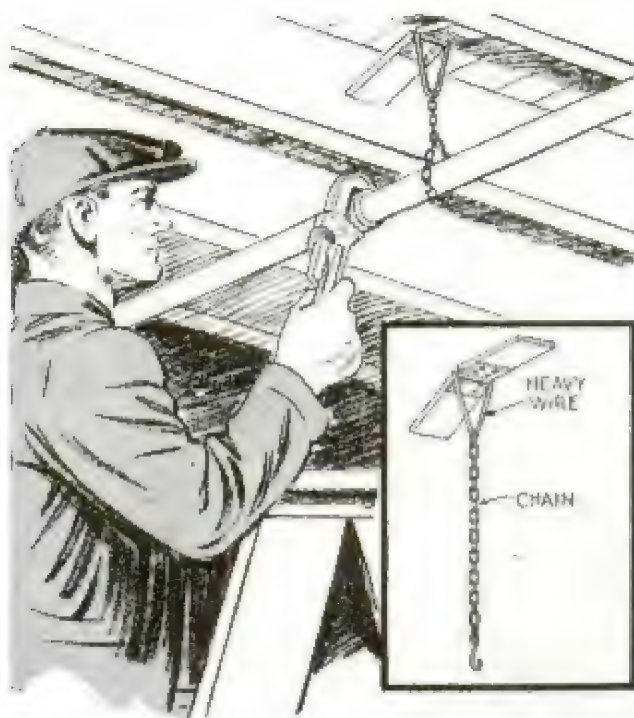


Anti-rattler for doors



Cutting smooth holes in plaster

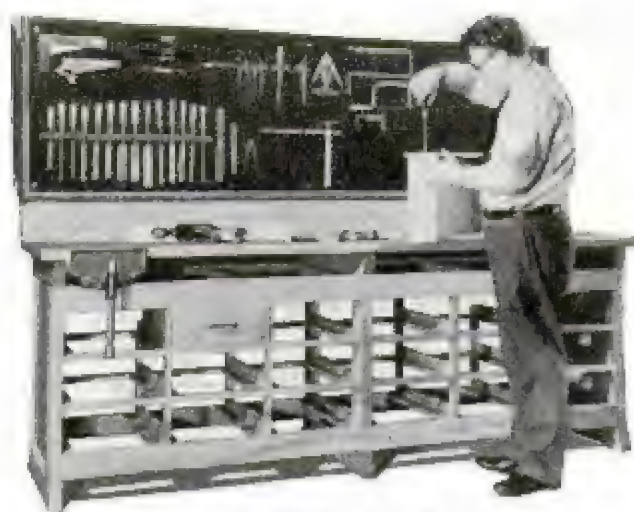
Upper left, bolting a U-shaped shield of No. 10-gauge sheet iron over the hot-water coil will practically double its life as the shield gives a more even distribution of heat. Above, when drafts cause inside doors to rattle annoyingly, take a cork disk from a bottle cap and glue it to the lower inside edge of the door. Left, two ice picks driven through a short strip of softwood make a good tool for cutting plaster. Of course, the distance between the picks is made equal to the radius of the opening you want



"Sky Hook" Holds Long Pipes While Assembling Them

For holding a length of heavy pipe while taking measurements or making connections, this "sky hook" or clamp wedges itself between floor joists. It consists of a pair of hinged blocks to which a length of chain and a stout hook are attached. In use, the clamp is opened and placed between two joists where it is held while the chain is pulled to spread it and bring the ends of the blocks against the timbers. The wire holding the chain is used as the pin for the hinge. If there is any possibility of the weight easing up on the blocks at times, it's a good idea to use a spring-type of hinge so that the ends of the blocks will be held snugly against the joists, regardless of the weight being supported.

Why Not Start a Home Workshop?



Cabinet Workbench—898

12-IN. BAND SAW—836: Smooth running and sturdy. Cuts 2-in. stock easily—25c.

DRILL PRESS—895: Pipe fittings. $\frac{1}{2}$ -in. chuck and ball-bearing spindle. 28 in. high—25c.

BELT SANDER—579: Heavy-duty type. Angle-iron framework and a 5 by 48-in. belt—25c.

CIRCULAR SAW TABLE—910: Angle-iron frame. 24 by 36-in. table, 10-in. blade—25c.

CARPENTERS' TOOLBOX—824: $8\frac{1}{4}$ by $13\frac{3}{4}$ by $31\frac{1}{4}$ in. in size. Has special rack for auger bits—25c.

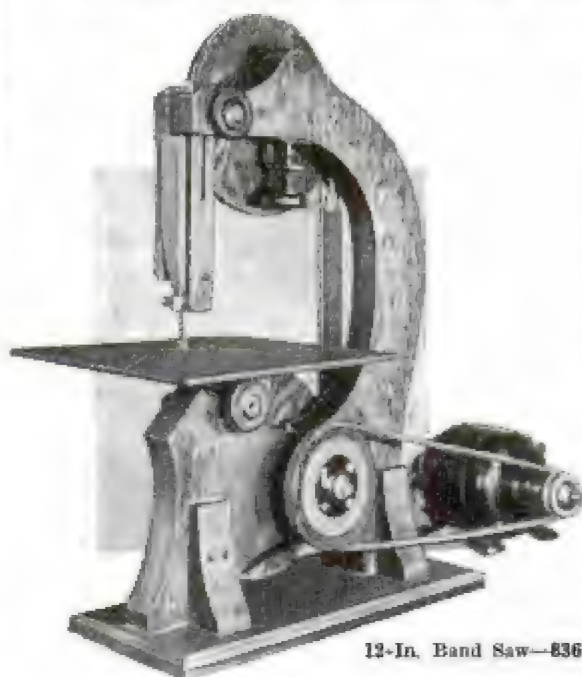
Any six of these blueprints will be sent postpaid upon receipt of \$1.00

A few homemade machines will enable you to get into this interesting field. Whether you want a shop for pleasure or profit, our plans will give you all of the information you need.

CABINET BENCH—898: Nearly 8 ft. long, 27 in. wide, 35 in. high. 20 drawers—25c.

THREE EASILY MADE WORKBENCHES—896 and 897: Designs that are applicable to benches of various sizes. Two prints 50c.

22-IN. SCROLL SAW—771: Pipe fittings and hardwood. Has sewing-machine drive—25c.



12-In. Band Saw—836

Blueprint Department, Popular Mechanics Magazine, 200 E. Ontario St., Chicago



SHOP NOTES

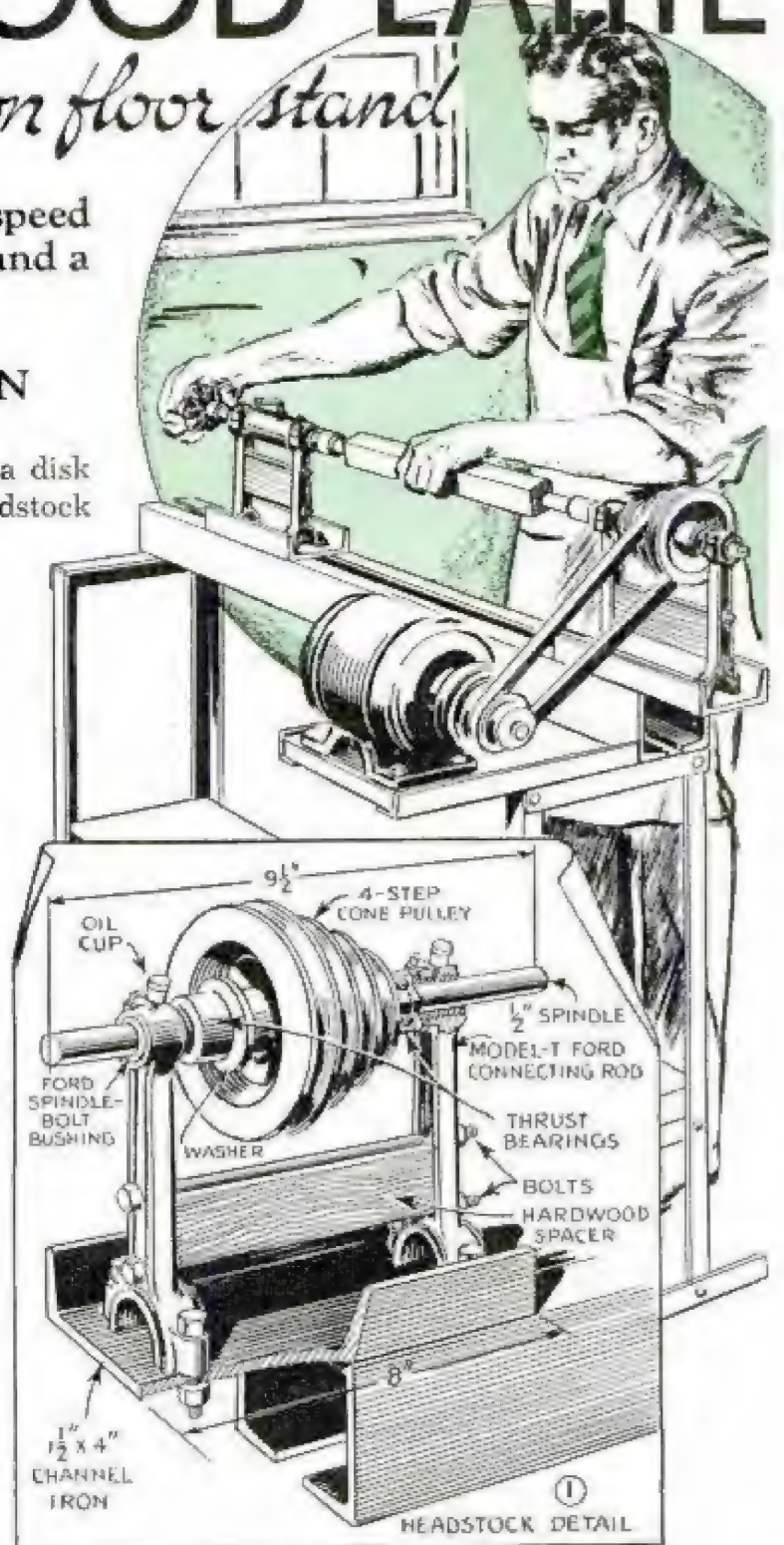
Blair 10-66 Homemade WOOD LATHE *mounted on floor stand*

Self-contained unit has four-speed V-belt drive, rigid iron bed, and a quick-acting tailstock

By ALBERT C. LARSON

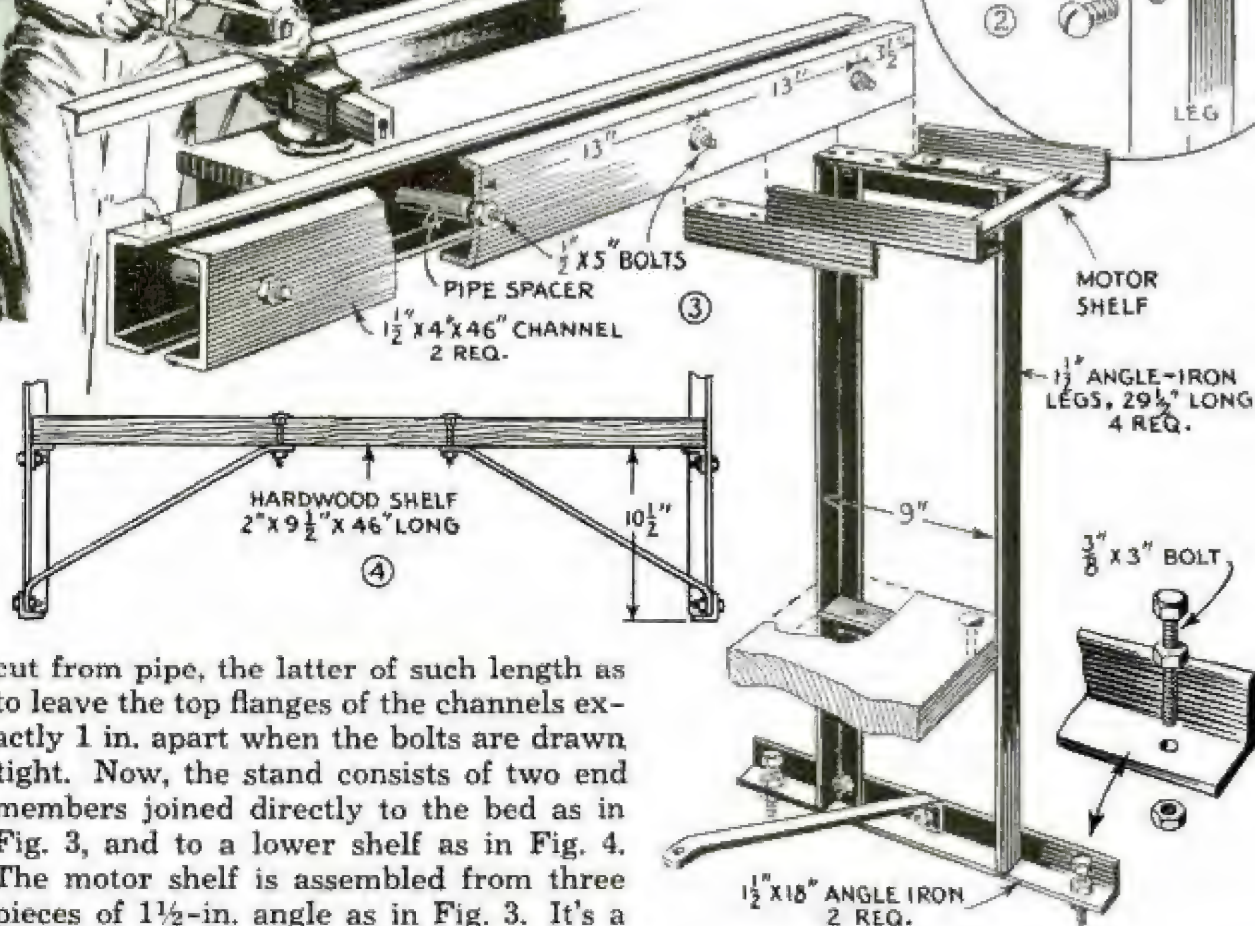
WITH this lathe you can swing a disk 12 in. in diameter on the headstock or turn down a full-length table leg between centers. The headstock spindle, Fig. 1, is supported on auto connecting rods bolted to a short length of channel which forms the base and is bolted to the bed. A hardwood spacer between the rods holds the whole thing rigid. The $\frac{1}{2}$ -in. spindle runs in Ford spindle-bolt bushings which are pressed into the upper ends of the connecting rods and then reamed to give the spindle a free-running fit. The spindle also carries two ball thrust bearings, one on each side of a four-step V-pulley. Polished flat washers are used to take out the end play, if any. The inner end of the spindle should project about $\frac{3}{4}$ in. to take a hollow-sleeve spur center of the type which locks in place with a headless set screw. This and the drive pulley, also the thrust bearings, can be purchased at little cost. Faceplates are also available.

The bed is simply two channels of the size given in Fig. 3. They are bolted together with spacers





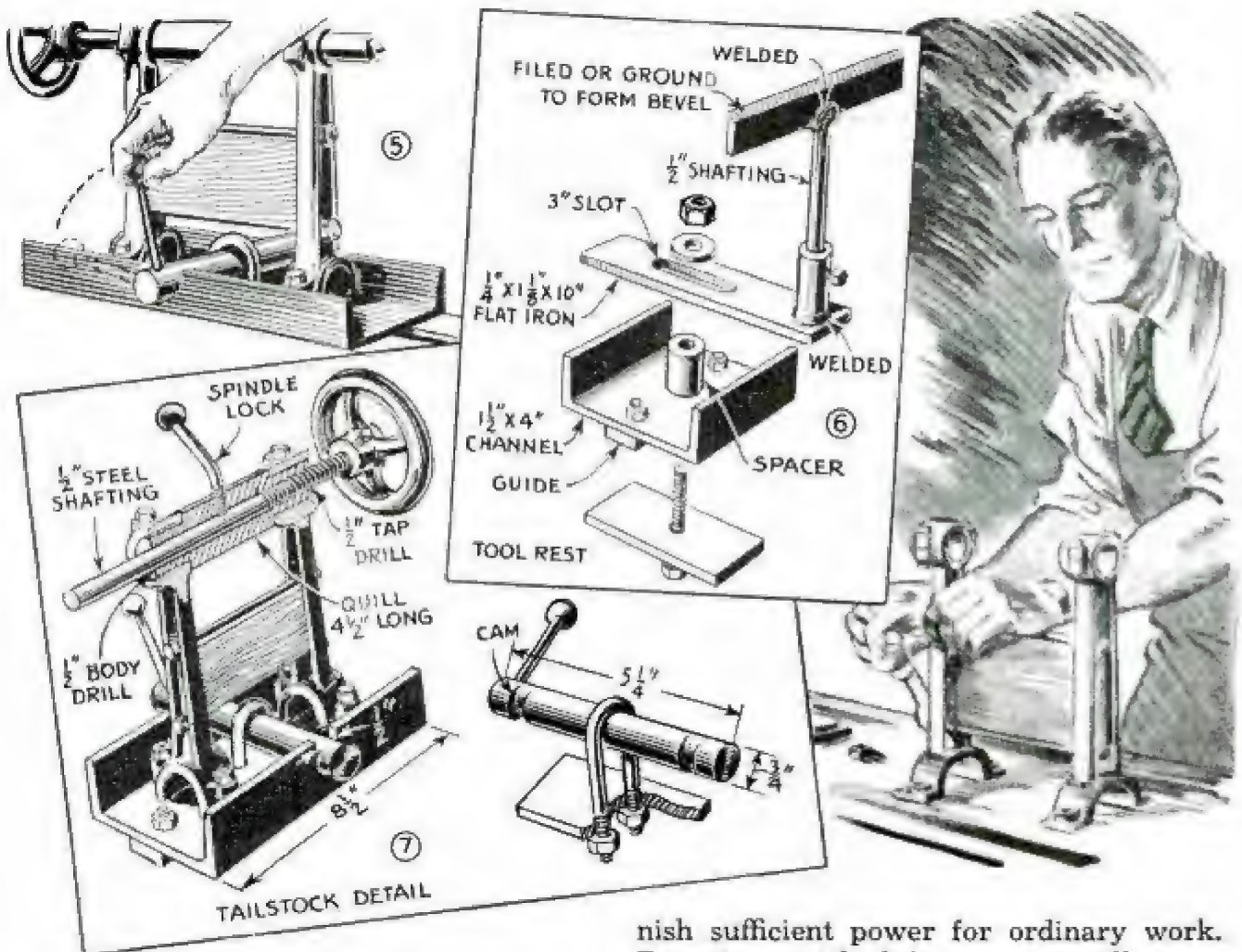
The top flanges of the bed channels can be trued by draw filing, then finished smooth with emery cloth wrapped around a block of wood. The tailstock base is fitted to the bed in the same way



cut from pipe, the latter of such length as to leave the top flanges of the channels exactly 1 in. apart when the bolts are drawn tight. Now, the stand consists of two end members joined directly to the bed as in Fig. 3, and to a lower shelf as in Fig. 4. The motor shelf is assembled from three pieces of 1½-in. angle as in Fig. 3. It's a good idea to make up the stand first, then cut these pieces to suit the motor and V-belt you are to use. Fig. 2 shows a trick in fitting angle iron that should be used in building this stand, as it results in a rigid joint. After the pieces are cut to required length, file one end of the angle which meets the corner of the second angle, in this case the leg, to a contour which allows it to fit snugly. Then clamp the pieces together and drill the hole for the stove bolt. If one piece is tapped as shown, use the tap drill first, then ream the outer hole with a body drill for the bolt. Or drill through with the body drill and tighten with a nut and lock washer on the stove bolt. Either way will do. Note that the hardwood shelf is braced to the foot, Figs. 3 and 4, and that the shelf rests on an angle-iron rail to which it is bolted. Foot pieces of 1½-in. angle are bolted to the ends of the legs. A machine bolt or cap-

screw is put through near the ends of each foot piece and held in any position with two nuts, one on each side of one leg of the angle as shown. This gives adjustment for leveling the lathe on any floor.

Finally, the tailstock and toolrest. Fig. 6 suggests a method of making the latter. You can purchase this item ready-made also. Figs. 5 and 7 show clearly how the tailstock is made. As you will see, it is very similar to the headstock. The quill is turned out of 1-in. cold-rolled steel shafting, the ends being shouldered back the length and diameter of the upper connecting-rod bearings, leaving a center section 4½ in. long. The quill is counterbored as shown and a portion tapped to take the threaded section of the spindle. The locking device consists of a cam rolling in slots cut in the channel-iron base as in Fig. 7 and actuated by a ball handle. The cam is

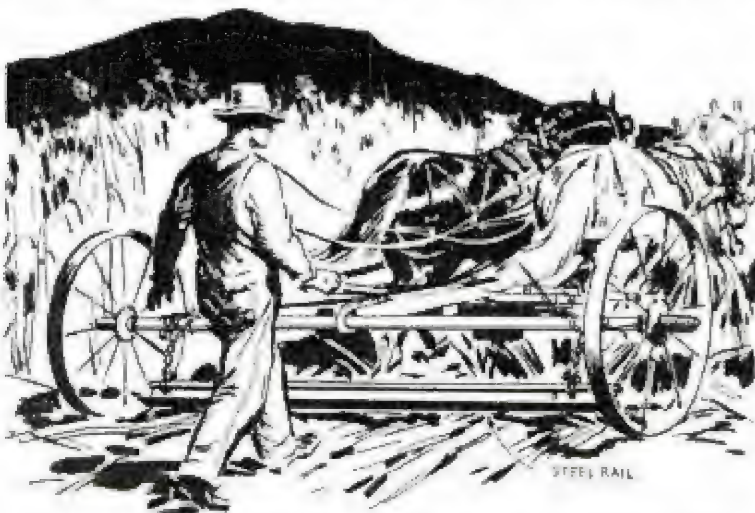


made by filing slots in a piece of $\frac{3}{4}$ -in. shafting. These slots cause the shaft to move eccentrically, lifting the U-bolt and the plate which bind against the flanges of the bed and tighten the tailstock at any position.

A $\frac{1}{4}$ -hp. motor of 1,750 r.p.m. will fur-

nish sufficient power for ordinary work. By using matched 4-step cone pulleys on motor and headstock you will not have to shift the motor to change the spindle speed. By making up hinged motor rails out of strips of hardwood or $\frac{1}{4}$ -in. flat iron it will be much easier to shift the belt when changing speeds. Hinged motor rails can also be purchased ready-made.

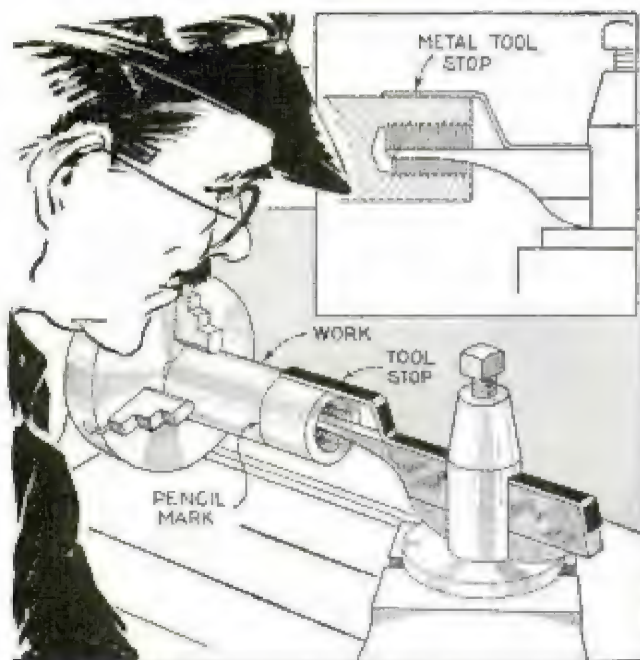
Easy-Pulling Stalk Breaker Is Suspended Between Wheels



You will be surprised how quickly a field of cornstalks can be broken down with this implement, which pulls so easily it can be handled by one team

Improving on the well-known method of breaking down cornstalks with a heavy timber, which is hard for a team to pull, one farmer took a length of railroad rail and fitted it with wheels as shown. The wheels were fitted to a length of $1\frac{1}{2}$ -in. pipe, which served as an axle, and a tongue for hitching a team was attached to it. If desired a dump rake can be used for the same purpose by locking the teeth in the raised position and suspending the rail from it. In either case, the rail should just touch the ground without dragging heavily.

Stop Gauge on Threading Tool Prevents Spoiled Work

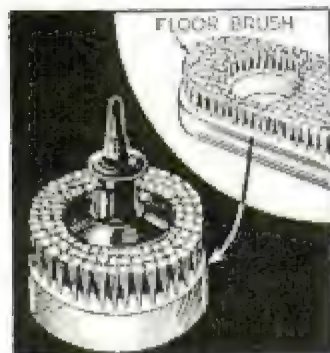


Use this stop gauge when cutting internal threads to avoid running the tool too far into the work

Intended for use when small diameter holes are threaded where it is difficult to see the tool point as it approaches the end of the cut, this threading-tool stop gauge will prevent running the tool too far into the work. A strip of sheet metal is bent to the shape shown and is clamped into the tool post with the threading tool. The stop gauge is adjusted so that it extends just as far as the cutter. In use, the work is marked on the outside at a point where the threads are to end on the inside.

—H. Moore, Hamilton, Ont., Can.

Combination Ink-Bottle Holder and Pen Wiper



ink bottle, and then in the center of this, cut out another disk to make an opening for the bottle. In use, set the holder with the bristles up and insert the bottle. When

Here is a simple gadget that will hold an ink bottle on your drawing board, and at the same time provide a place to wipe the pen. From a floor brush, cut out a disk about twice the diameter of the

your pen needs cleaning, just give it a few swipes across the bristles, which can be washed when they become dirty.

—Opie Read, Jr., Chicago.

Tops Cut from Screw-Top Cans Level Incubator

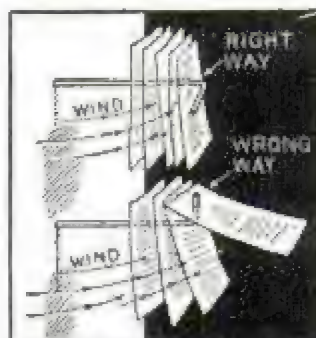
To avoid the necessity of using bits of wood and pieces of cardboard to level his incubator on uneven surfaces, one poultryman uses tops cut from small screw-top cans.

By placing one of these under each leg of the machine, he was able to level it quickly by merely turning the tin caps up or down on the mouth-piece sections of the can.

—G. E. Hendrickson, Argyle, Wis.



Cards Stay on This Wall Spindle

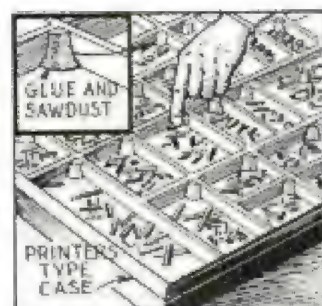


To keep cards or papers from blowing off a wall spindle when the office windows are open, one shipping clerk bent the pointed end over at right angles and turned it down as shown.

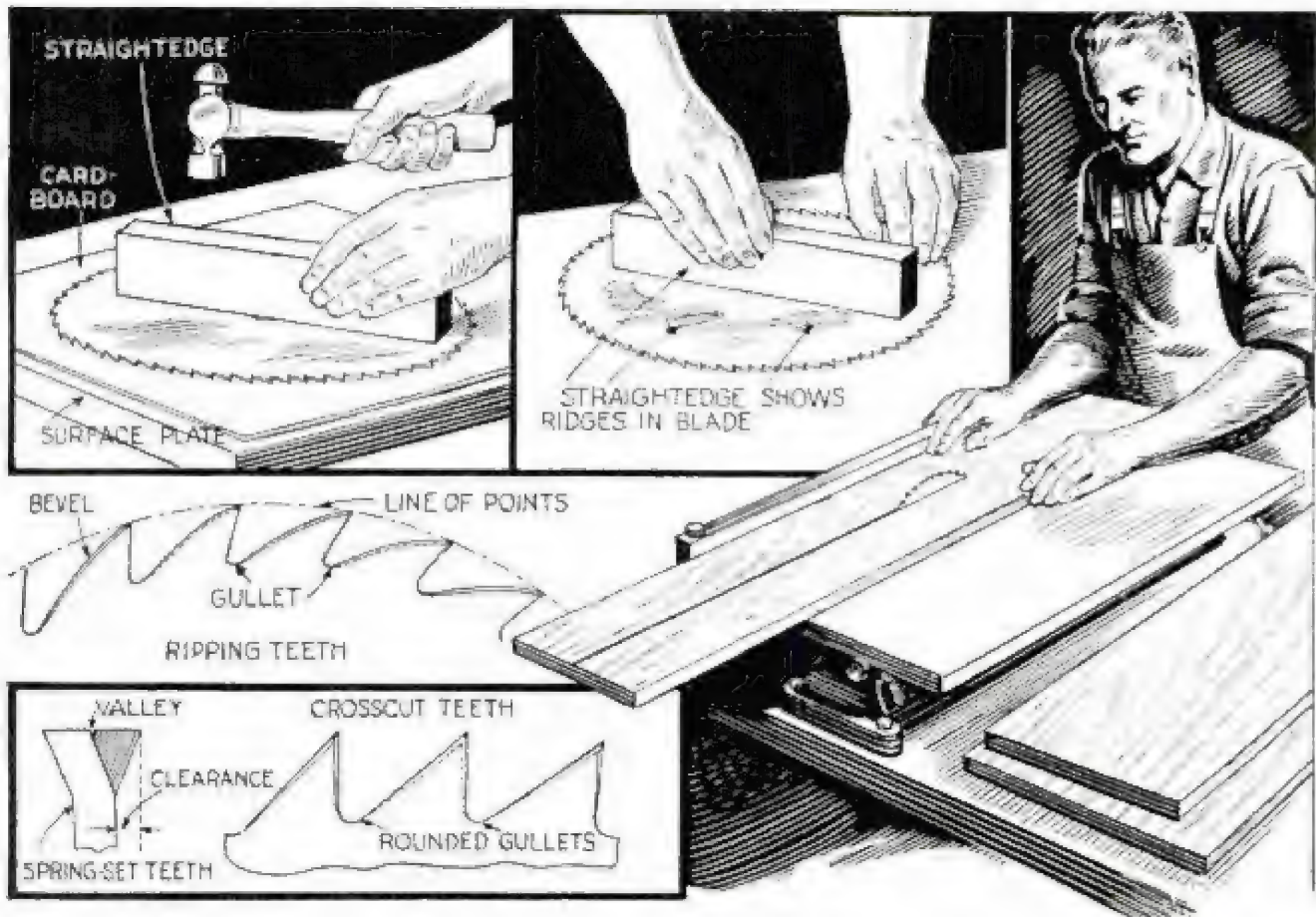
While the bent end made it awkward to slip the papers on the hook at first, a little practice soon overcame this trouble.—Floyd Mumm, Evanston, Ill.

Printers' Type Case Improved by Rounding Corners

To keep small type from getting into the corners of a type case, where they were hard to pick up, one printer rounded the inside corners of each compartment with plastic. This can be made by mixing fine sawdust and glue to the consistency of putty.



An Easy Cure for "Burning" Saw Blades



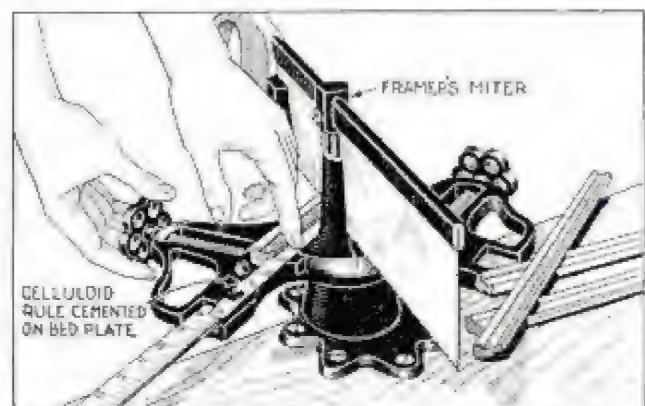
If your circular saw blade heats and drags in the cut, look first to the condition, particularly the set and shape of each individual tooth in relation to its neighbors. Correcting any irregularity of the teeth that turns up on examination will generally cure the trouble. Occasionally, however, the burning will persist. When this happens, cut a piece of cardboard about 1 in. larger than the blade, lay the piece on a flat surface, and center the blade over it. Make a straightedge from a bar of flat steel, cutting it off squarely and 1 in. less than the diameter of the saw. Moving this about over the blade will show up any bulges or depressions caused by heating and consequent stretching of the metal. Once located these irregularities are easily hammered flat in the manner shown. When you finish with this treatment, the blade must be re-set, gummed and carefully filed, paying particular attention to the shape of the teeth if you file by hand.

☐ Always place a camera on a tripod or other support when taking photos requiring more than a $\frac{1}{25}$ -sec. exposure.

Framer's Miter Vise Has Scale to Cut Short Molding

As molding for frames shorter than 7½ in. cannot be measured for cutting in an ordinary framer's miter vise, a celluloid rule with divisions from 2 in. to 8 in. can be cemented to the bedplate of the vise as shown. In attaching the rule, clean the bed thoroughly to remove rust, grease, etc. Most of the all-purpose household cements will hold the rule to the bedplate.

—P. W. Rowden, Colorado Springs, Colo.



Short rule cemented to bedplate of miter vise to measure short pieces of molding

GOOD BRUSHES



By BERTON ELLIOT

THE real value of a paintbrush is not in the kind of ferrule or the size and shape of the handle but in the bristles. Of course, a quality brush will have a handle designed to make the whole thing balance to a nicety and it will be shaped to fit the hand comfortably. The ferrule will be made to assure rigidity of the handle, but after all, the bristles do the work.

Hog bristles imported from China are especially adapted for paintbrushes, as they have and retain a natural elasticity and springiness possessed by no other kind of bristle. The flag ends, Figs. 1, 2 and 3 are an especially valuable feature as will be seen from Fig. 3. These flag or flagellated ends enable the brush to hold the paint and spread it evenly in a thin film. Mixed bristles are nearly always used in large brushes, that is, some stiff and some softer bristles are uniformly distributed in the same brush, to give the required degree of elasticity for the size and kind of work it is to do. In some brushes, also, both long and short bristles are used in the same brush—a small percentage of the shorter bristles with their flag ends being useful to help prevent the paint leaking down the handle when working on ceilings or high surfaces.

For wall painting, inside and outside, a flat wall brush, Fig. 4, is used. The professional painter usually prefers a long-bristle brush, Fig. 9, for the reason that it holds more paint, therefore requiring fewer dips to the paint pot, and enabling one to cover more square feet of surface per

for GOOD PAINTING

What a master painter looks for when he picks out brushes for various jobs; how he uses the brushes and how he keeps them in good working condition

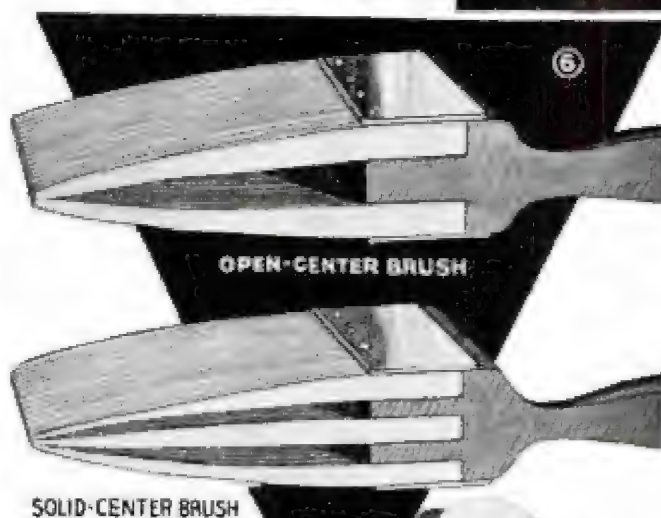
day. A long-bristle brush will also last longer under steady, continuous service. For the amateur, however, a short-bristle brush, Fig. 10, is better, as one must be experienced in order to use the long-bristle brush. The former, if made of high quality bristles properly balanced, will do good work and costs considerably less. Wall brushes are made in various widths from 3 in. to 5 in., the most popular being the 3½ and 4-in. sizes.

For varnishing, enameling and lacquering, a flat varnish brush is ordinarily used. Most of the high-grade varnish brushes are made with a chisel or tapered edge, being so shaped to permit easier flowing of the varnish, enamel or lacquer. Flat varnish brushes come in different widths from 1 in. to 3 in., the width used depending upon the size and nature of the surface to be finished. For window sash, spindles, scroll work, etc., the painter uses a sash brush—a small-size tool from 1 to 2 in. wide for working in close places, and a wider one for larger trim work. Sash and trim brushes are made with a long handle. Another type that should be mentioned here is the calcimine brush which is usually about 7 or 8 in. wide, with a sturdy handle, as shown in Fig. 16. The important thing about calcimine brushes is their care. They should be washed in clean water immediately after using, the bristles straightened out, and the brush hung up by the handle to dry. The calcimine brush should never be used in oil paints. Careful painters always use a dusting brush for cleaning dust, cobwebs and soot off the surface before painting. Dusting brushes are made in the same general way as the ordinary paintbrush, but with finer bristles and are available in both flat and round styles.

Having selected the proper size and type of paintbrush for your work, its



⑤ *Testing spring of bristles*



⑥ OPEN-CENTER BRUSH

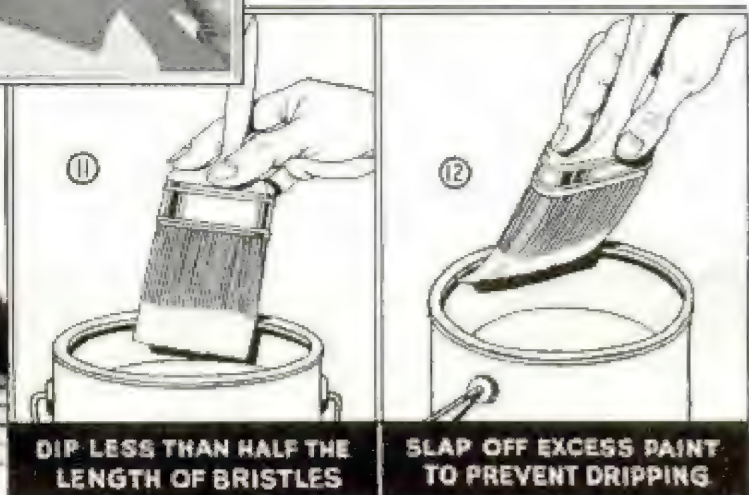
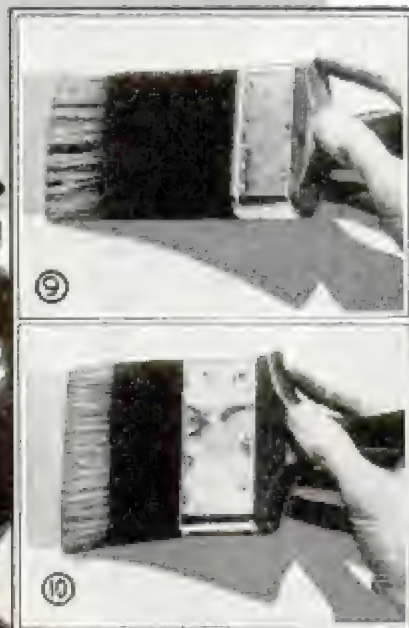
SOLID-CENTER BRUSH

Thorough mixing



⑦

*Avoid laps on
interior work*



DIP LESS THAN HALF THE
LENGTH OF BRISTLES

SLAP OFF EXCESS PAINT
TO PREVENT DRIPPING

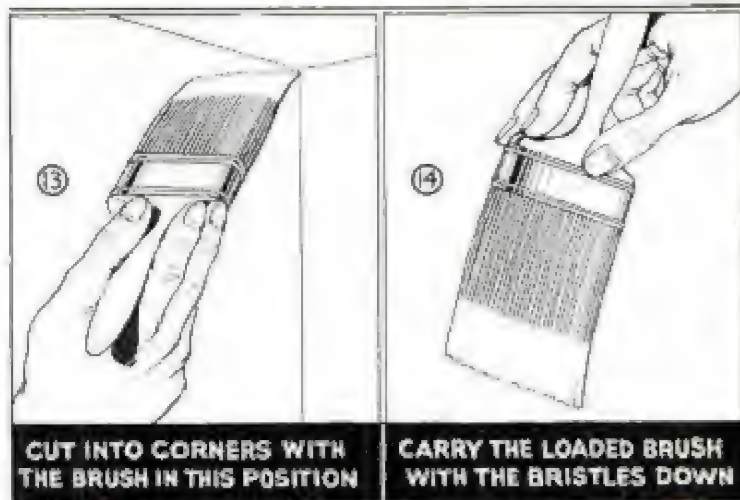
quality is not so easily determined, as it is difficult to distinguish a good brush from a poor one by appearance alone. Here are some of the principal points the painter desiring a high quality tool looks for when buying a brush: First and foremost is whether the brush has a large percentage of full-length bristles. The painter also wants to know whether the brush is 100 per cent hog bristles, as some cheaper brushes contain vegetable fiber, horsehair and other substitutes which do not have the valuable flag ends. In some of the cheaper brushes, also, the bristles have not been treated to permanently take out the curl. A brush with bristles which tend to curl is useless. One practical test for quality in a new brush is to bend the bristles over the back of the hand as in Fig. 5. Tested in this way a good brush will show considerable spring and elasticity. In the

of a board several times to throw out dirt particles. Then work out any loose bristles with the fingers. Finally dip the brush in turpentine and work it on a clean board or piece of paper.

Before you start painting any surface it is of the utmost importance that the paint be thoroughly mixed, Fig. 7, and thinned to an easy brushing consistency. If the paint "drags" under the brush it is too thick. In applying paint of any kind, the brush should be dipped into the liquid only about one-third the length of the bristles as in Fig. 11, and the excess paint slapped off against the pail as in Fig. 12. When carrying the brush from the pail to the work, keep the loaded bristles down as in Fig. 14. This prevents the paint running into the bristles close to the ferrule. In painting you hold the brush easily in much the same manner that you hold a pencil in

calcimine brush the bristles are usually set in the handle in two banks or sections to form an open center as in Fig. 6. In paintbrushes of the wall type the bristles are generally cemented together and set in the handle in three sections as in the lower illustration. These sectional views show this construction only in a general way, as manufacturers use different methods. In a high-grade brush, there are always a few loose bristles which have not become anchored in the setting but these will soon work out in use. Before using a new brush, strike it smartly across the edge

drawing a line, Fig. 8. Keep in mind that excess pressure on the brush will accomplish nothing, for it is the ends of the bristles that spread the paint film uniformly. On siding, Fig. 17, use as long strokes as possible, lifting the brush lightly from the surface at the end of each stroke. Never press or jab the brush into corners, as this breaks off the flag ends of the bristles. In outside house painting particularly, the paint should be brushed back and forth to work it thoroughly into the surface and draw it out into a thin film of uniform thickness. Only this method of brushing gives maximum surface protection against outdoor exposure. Flat wall paint, on the other hand, should have a minimum of brushing because you have to work faster to avoid laps. The paint is applied to a



small section and "laid off" by stroking lightly without refilling the brush. Continued brushing is likely to bring the liquid to the surface and make glossy spots, or may pile up the pigment into rough areas which will leave brush marks. In laying off, avoid a straight stroke, using instead a sweeping, curved motion. When you have to get into corners, set the loaded brush into the corner as in Fig. 13, then draw the paint away with a light, quick stroke. A somewhat similar method is used when "cutting" or tracing sash as in Fig. 15. Still another method of brushing should be used in applying varnish, enamel, or lacquer. These materials are flowed on with a full brush, the flowing stroke made first with the grain of the wood. The varnish will level to a fairly smooth finish of its own accord. It should then be stroked lightly across the grain, and, as a final





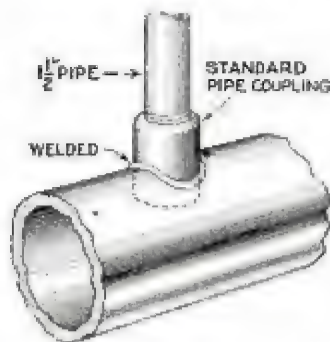
touch, with the grain, using an "empty" brush, Figs. 18 and 19.

It pays to get a good brush and keep it in good condition. Brushes should be cleaned in the proper solvent liquid immediately after using. Those that have been used in paint may be cleaned with gasoline, naphtha, turpentine or benzine—gasoline being cheaper, and fully satisfactory. Brushes that have been used in var-

nish or enamel should be cleaned with turpentine or benzine only, never with gasoline or naphtha, as these solvents cause the varnish gums to "curdle" or form into small solid particles which will come out on the surface when doing the next job. Shellac brushes are always cleaned with wood alcohol—lacquer brushes with lacquer thinner. Clean thoroughly by submerging the brush and working the cleaning liquid well up into the bristles with the fingers, Fig. 20. Shake the brush vigorously to throw out the dirty cleaning liquid and undissolved particles of paint, then wash again in clean solvent. Straighten the bristles with a wire brush as in Fig. 21 and follow by a thorough washing in soap and water as in Fig. 22. While many master painters do not recommend cleaning brushes in water, it will help to get the brush thoroughly clean and is safe so long as the bristles do not become water soaked and swelled. When cleaned in this way, the brush should be dried carefully, the bristles straightened and then wrapped in paper. Brushes should never be stood on end, as this tends to curl the bristles and destroy the working shape. Always lay them flat or suspend them by the handles in a covered container in which is enough linseed oil and solvent to cover the bristles. If the brushes are unused for some time don't forget to replace the liquid lost by evaporation. You'll find it's good economy to keep several brushes on hand and use separate ones for painting, varnishing, lacquering and enameling. If, for example, you use a varnish brush for paint it will be impossible to clean it satisfactorily for use in varnish again. Of course, a paint-brush is useless for applying varnish, no matter how carefully it is cleaned.

Making Manifolds from Pipe

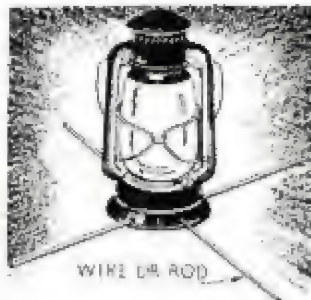
As drilling and tapping small pipe to make manifolds is unsatisfactory because the thin wall of the pipe does not permit sufficient threads, couplings can be cut to fit and welded on as shown. These are located in holes previously drilled and the welding must render them leakproof. As an aid in setting the coupling at right angles, you can use a pipe nipple and a square.



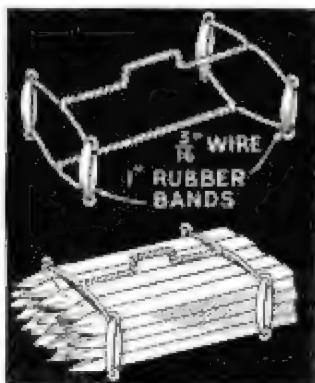
—L. H. Georger, Buffalo, N. Y.

Braces on Red Warning Lantern Keep It from Tipping

It's very easy to avoid tipping of red warning lanterns used on streets and roads when repairing them. Just drill four equally spaced holes through the rim around the bottom of the lantern and insert 2-ft. lengths of heavy wire or light iron rods. When not in use, the wires or rods can be removed easily and stored until they are needed again.



Expanding Stake Carrier



or light iron rods twisted together, the carrier is assembled with wide rubber bands, which can be cut from old inner tubes.

Surveyors and others who use stakes or similar objects in quantities will find this carrier useful as it automatically expands to accommodate bundles of various sizes. Made from lengths of heavy, stiff wire

Ends of Steel Cables Welded to Prevent Fraying

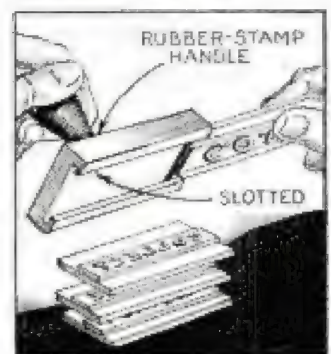


If the ends of wires in a steel cable are fused together they will not fray

Instead of whipping the ends of steel wire cables to keep them from fraying, one contractor, who needs several of them in his work, uses a welding torch to fuse the ends of the wires together. The fusing extends back about $\frac{1}{4}$ in. from the ends, which are first cut off square.

Rubber Stamp Has Letter Pads That Are Interchangeable

To avoid carrying a number of stamps in his hands while stamping crates and packages outside his office, one shipping clerk uses a large stamp that has interchangeable letter pads. The handle is a regular stamp with the bottom side slotted, as indicated, to take the pads, which are cemented to thin pieces of wood.



When house flies gather on door or window screens, rub the latter with a cloth dampened in kerosene; flies dislike the odor of kerosene and will soon leave.

Women Look in Show Window to "Try On" Hats

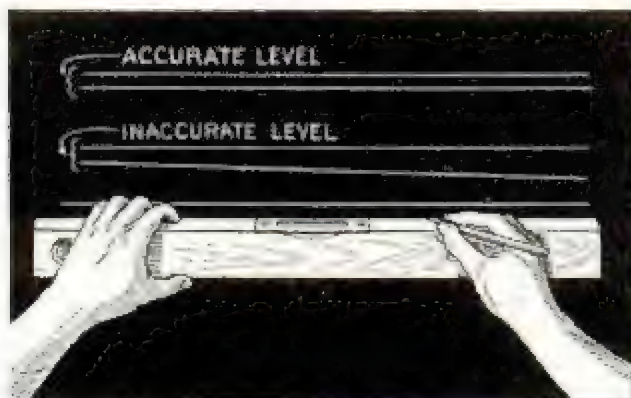


Women looking into mirrors supporting hats on display in window, can see how the hats look on them

Women walking in front of the show window of one millinery store can look into mirrors under the hats, which gives the impression of wearing them. Oval mirrors are used for this purpose and they are mounted on wooden backs, which are in turn attached to suitable standards.

Testing Level for Accuracy

To test a level for accuracy place it flat against a vertical surface, adjust it in a horizontal plane until the bubble registers exact center, then hold it firmly in place and draw a pencil line upon the backing surface, using the edge of the level as a ruler. Now, reverse the level, end for end,

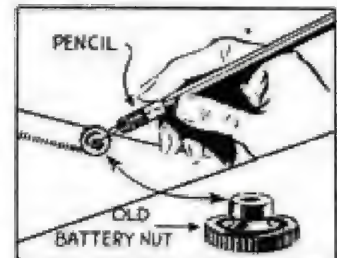


It takes only a minute to test the accuracy of a level by this method

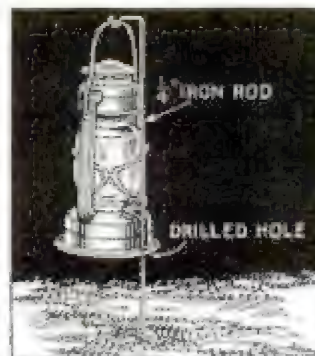
drop it about an inch below the first line and repeat the process. If carefully done, and the two lines drawn are parallel, the level is reasonably accurate. If the lines diverge, the instrument is not dependable.

Roller Stylus on Lead Pencil Cuts Mimeograph Borders

Producing neat bands or borders of short parallel lines, this stylus can be made from a dry-battery nut and a length of wire. The wire is slipped through the nut, after which the ends are bent together and inserted into the eraser end of a lead pencil, the wires being pushed between the rubber and the ferrule that holds the eraser.



Lantern Kept from Swaying



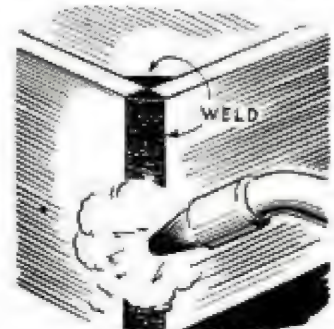
One contractor found that he could keep his red warning lantern from swinging in the wind by passing the rod supporting it through a hole in the rim around the base of the oil fount.

Care must be taken in drilling the hole to avoid puncturing the fount.

Welding Corners of a Steel Tank

When joining the seams of a steel tank, or the corners of a metal box or pan, try welding the seams and corners on both sides instead of just one side.

While double welding increases the cost, it makes a strong, rigid job which will withstand strains and prevent the seams and joints from opening and causing leaks.

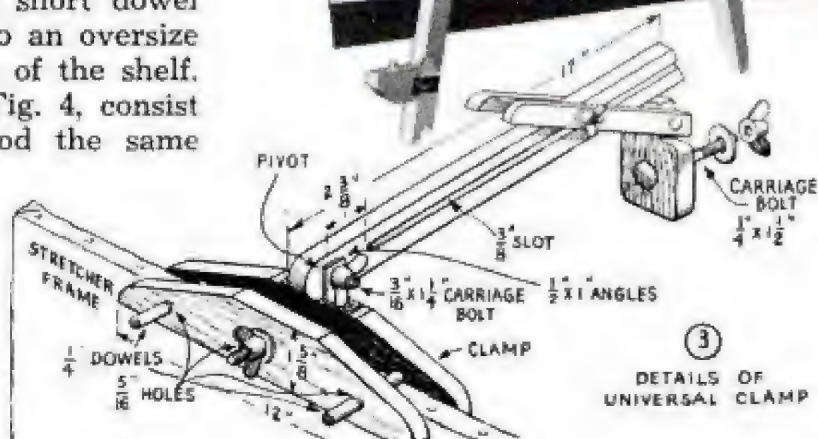


This Sketching EASEL *has universal adjustment*

A clamp attached to the back of the tripod holds your canvas or board in any position

By FRED STRICKLAND

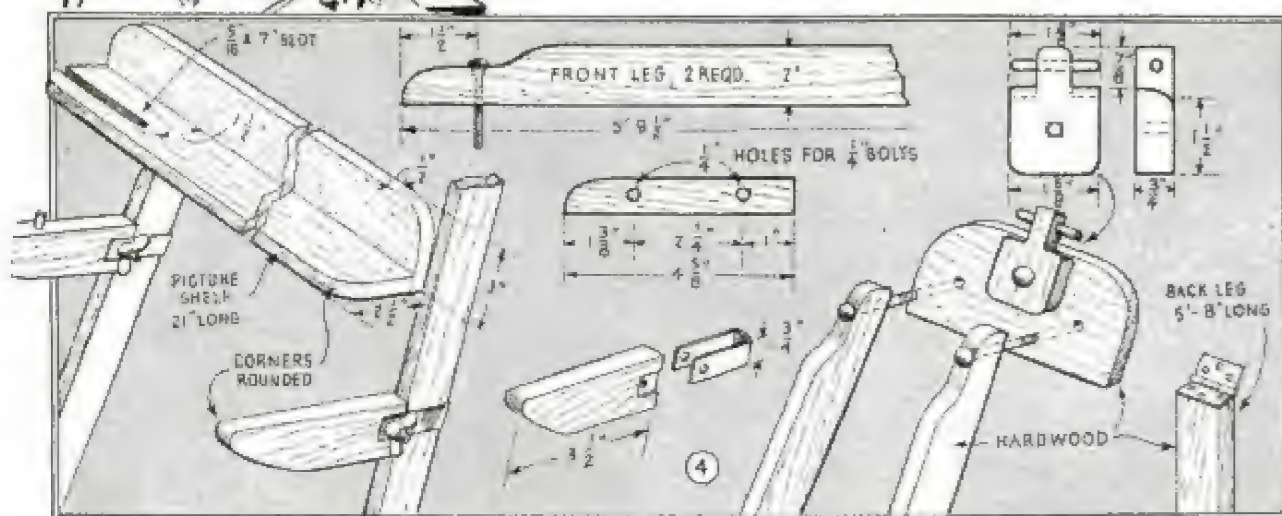
WHEN doing portrait work or making outdoor sketches it often happens that you want the working surface tilted forward to kill annoying reflections, or possibly canted sidewise to enable you better to capture some elusive detail. These adjustments are taken care of with the clamping arrangement pictured in Figs. 1, 2 and 3. The clamp works in combination with the picture shelf, Fig. 4, or independent of it, as required. Both are really accessories to the tripod, which is a simple affair as will be seen from Figs. 2 and 4. If you want permanence and rigidity, build the whole thing of seasoned hardwood, such as oak or maple. There's no need for any elaborate tool equipment to get out the few pieces required. After ripping the legs roughly to size, be sure to plane the two front ones to exactly the same width so that the sliding arms which support the picture shelf will work properly. The latter can be made any reasonable length. The general construction is shown in Fig. 4. One end is slotted to engage a dowel; the other end can be fastened to the supporting arm with a screw or can simply drop over a short dowel projecting from the arm into an oversize hole bored in the underside of the shelf. The self-locking supports, Fig. 4, consist of short blocks of hardwood the same width as the legs but $\frac{1}{8}$ in. thicker. A $\frac{1}{16}$ -in. strip of brass, $\frac{3}{4}$ in. wide, is bent to a U-shape and the ends are drilled for a $\frac{1}{4}$ -in. bolt with wing nut. The ends of the U-shaped strip are inlet $\frac{1}{16}$ in. into





the thumbscrew will lock it in any position.

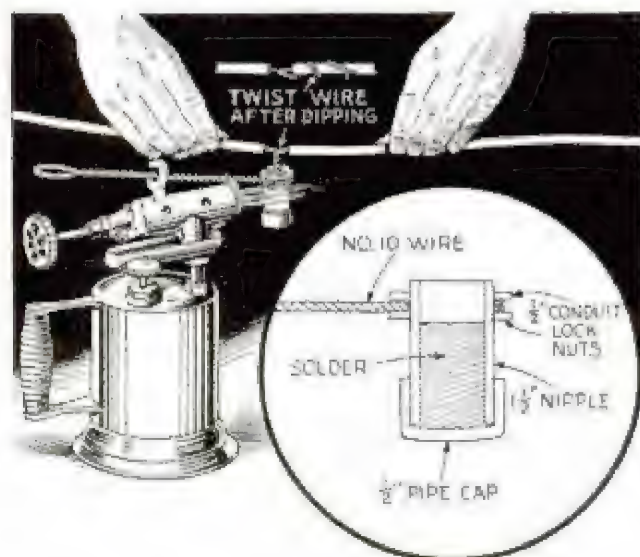
Now the clamp. This swings on a pivoted yoke made from two strips of hardwood, Fig. 4, a slotted arm, and two jaws as in Fig. 3, which shows the assembly of the whole thing. The inner jaw is pivoted on the end of the slotted arm and the movable jaw slides on dowels. Tightening the thumb nut on the outer movable jaw clamps the two together. The clamp is sufficiently strong to support a large mounted canvas without the aid of the adjustable shelf, or, by resting the lower edge of the canvas frame on the shelf, the sur-



the end of the wooden arm. When the bolt is put through there should be about $\frac{1}{64}$ in. clearance between the end of the arm and the edge of the leg so that the support will slide up and down freely. Turning up

face can be tilted to any angle by simply adjusting the clamp jaws and the sliding arm. To make the whole arrangement work freely and smoothly, use washers under all the thumb nuts.

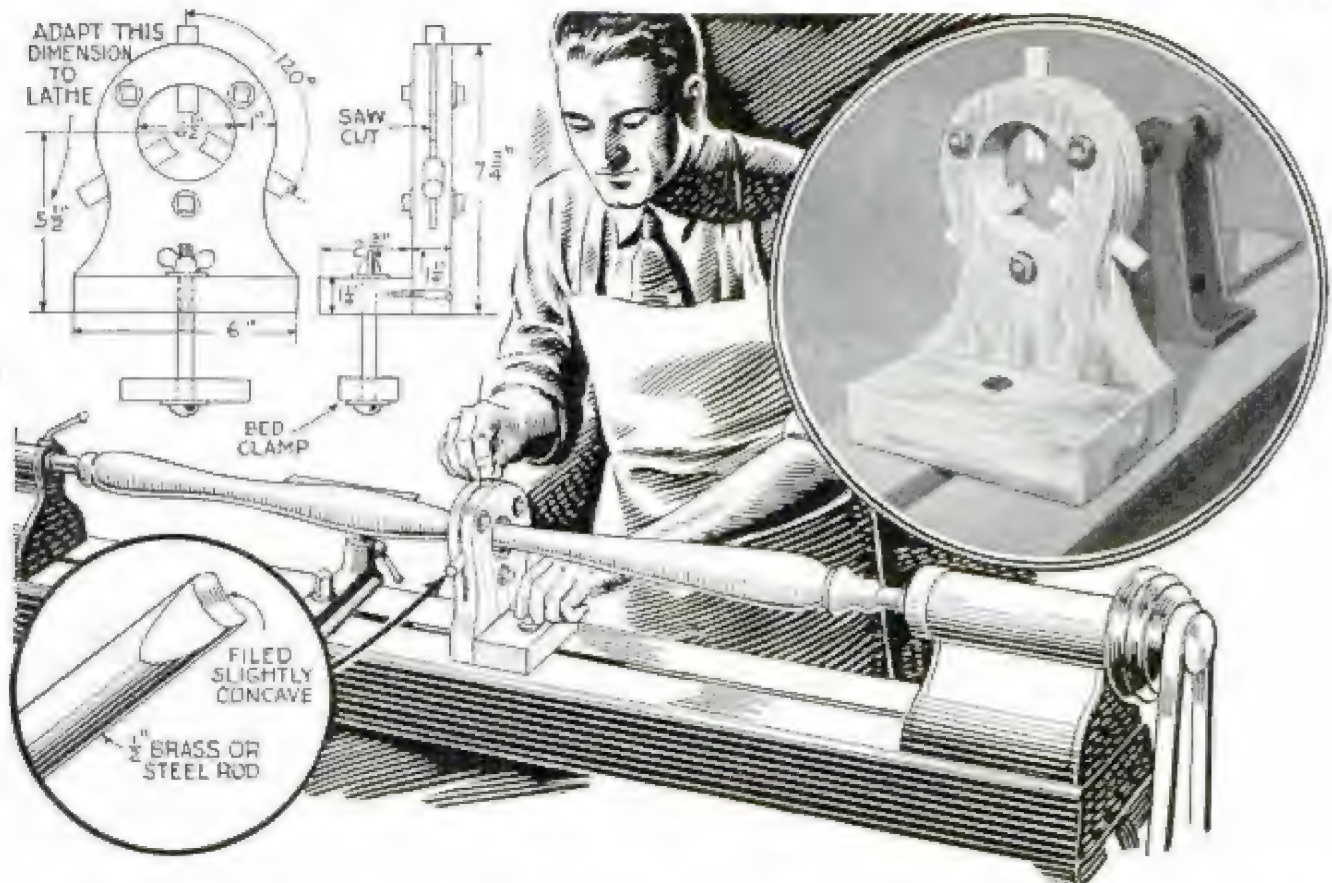
Electrical 'Pig-Tail' Connections Dipped into Molten Solder



For electrical jobs such as fixture work as well as any other work that involves soldering of "pig-tail" connections, this little cup holds molten solder. It consists of a pipe nipple and cap, and it is fitted with a twisted wire handle, which is held in place on the cup firmly by means of two lock nuts driven on the threaded end of the nipple as shown in the detail. In use the cup is set in the flame of a blowtorch, and is filled with bits of solder. When the solder is melted, you can hold the cup up to the connections, after flux has been applied. Or, with many kinds of bench work, you just leave the cup in the flame and dip the connections into the solder.

—Morris Katz, Aurora, Ill.

Homemade Steadyrest for Spindle Turning



Indispensable where long spindles are turned in a lathe, this steadyrest permits the work to rotate freely without vibration. A sturdy frame is made of $1\frac{1}{4}$ -in. hardwood, which is bored to take stock generally used. Then a slot is cut and three

brass rods are set in holes bored for the purpose. Bolts clamp them firmly in position when the work has been centered. It is necessary, of course, to true up the portion of the work which comes in contact with the steadyrest before using it.

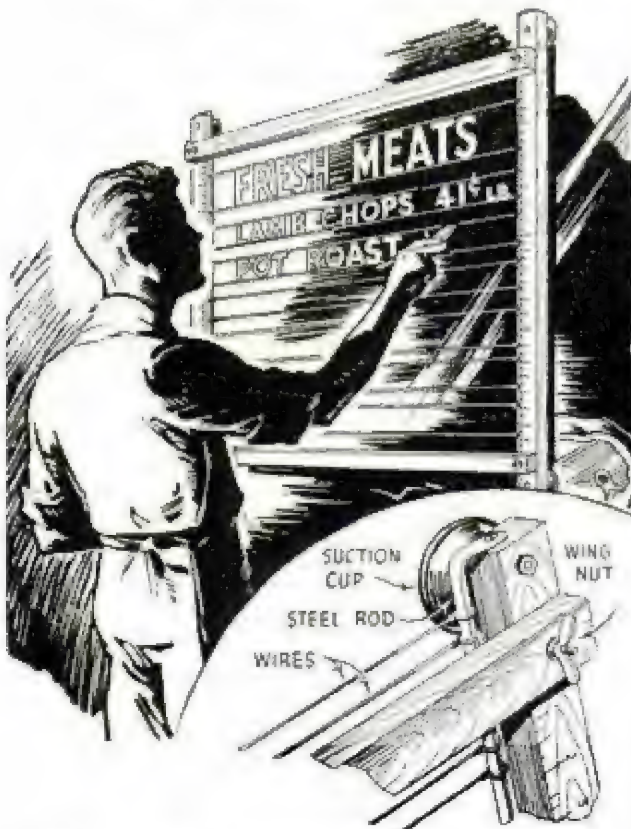
Cashier Can Photograph Suspicious Persons at Window

By merely pressing a bulb with the foot to operate the shutter of a small, hidden camera, the cashier of one department store can take a photo of any person appearing before her window. Such photos of persons suspected of passing bad checks and other bogus papers by the cashier have often been helpful in later check-ups. The camera is mounted in the cashier's cage out of sight of anyone on the outside with the lens focused on the window. A rubber tube leads from the camera to the bulb, which is placed on the floor.

❏ If dull-finish black paper is rolled to the shape of a cylinder to fit over the camera lens, and the overlapping edges of the paper are pinned together or glued, you will have an effective sunshade.



Line Guide to Write on Windows Assures Uniform Lettering

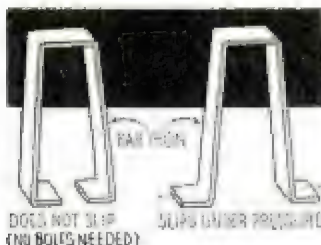


With the aid of this guide anyone can do neat, uniform lettering on his show windows

Butchers, grocers and others who letter advertising on their show windows will find that they can do a neat, uniform job with this simple guide. Attached to the glass by means of vacuum cups, the guide consists of a wood frame put together with small bolts and wing nuts. Small iron rods flattened at the ends and bent over at right angles are screwed to the ends of the two vertical wood members. To these rods are fastened small wires, which serve as line guides in the lettering. The wires, of course, are a loose fit on the rods so that they can be moved up or down to adjust the height of the lettering.

—Adolph Tabako, Minneapolis, Minn.

Table and Machine Pedestals That Will Not Slip

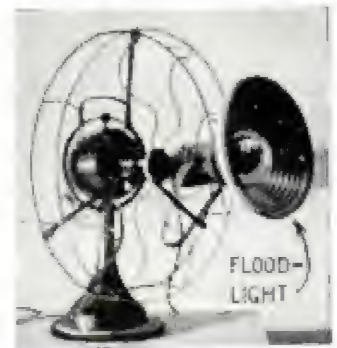


In designing metal pedestals for benches and machines, one designer claims that the one shown on the left has less

tendency to slip on the floor than the one on the right. When weight is applied to a pedestal with the feet turned in, a slight spreading of the legs tends to cause the feet to dig into the floor and prevent slipping. But when the legs of a pedestal with the feet turned out spread slightly under weight, the outer edges of the feet tend to turn upward, which, of course, allows the bench or machine to slip on the floor.

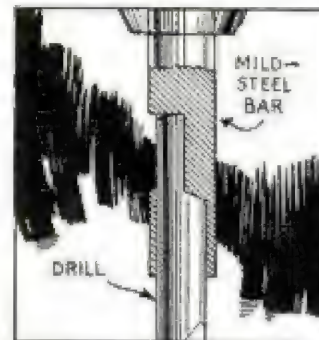
Flood Lamp Attached to Fan Has Oscillating Movement

When a flood lamp is used to illuminate a large display in a show window, it can be made to oscillate and spread the light over the display by attaching it to the blade guard of an oscillating electric fan. Before attaching the lamp, the blades of the fan should be removed, after which the oscillating mechanism can be adjusted to suit. If desired, the lamp and fan cords can be plugged into one socket and a switch used to control both.



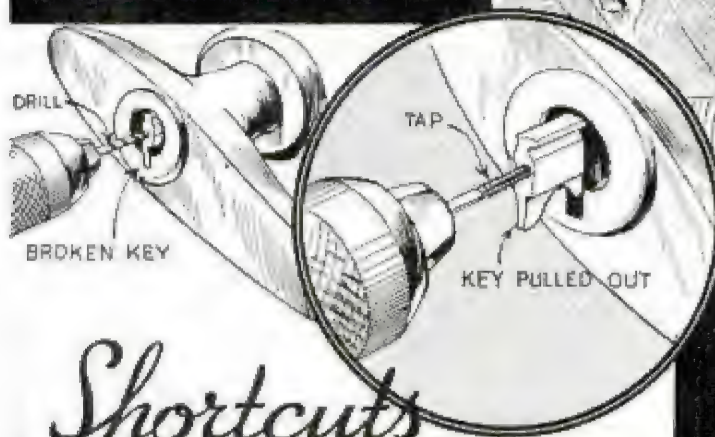
Drill Extension Easily Attached

When you have a job that requires using an extension on a drill, here's an easy method of attaching the extension. Get a suitable length of mild-steel bar or rod having a diameter somewhat larger than that of the drill to be used, and drill a hole transversely in one end to a depth of about $\frac{3}{4}$ in. The hole should be of a size to take



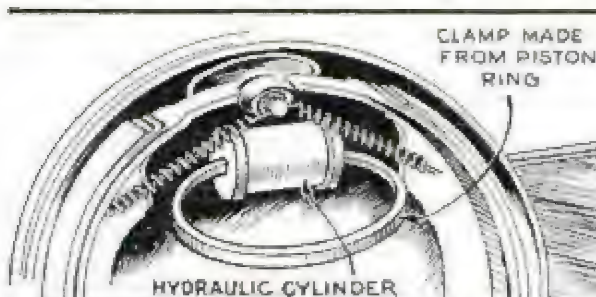
the drill snugly. Then, at the end of the hole, file a flat halfway through the extension, giving the flat a width equal to the depth of the hole. Next file a flat at the end of the drill so that it will slip into the extension as indicated.

If you break off a key in the door lock, just drill a tiny hole in the end, insert a small tap and pull out the broken part. In the absence of a tap, try using a wire with a roughened end

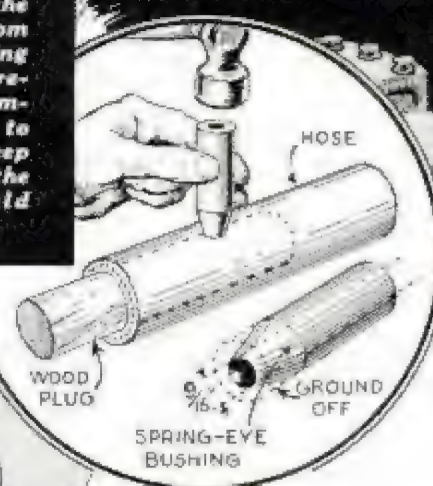
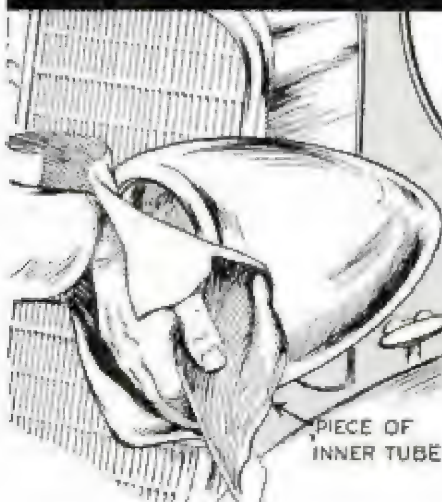


Two lengths of iron rod turned down at the ends to form shoulders and threaded make good "bolts" to hold oil pans while starting the cap screws

Shortcuts for AUTO MECHANICS



Above, old piston rings serve as clamps to hold plungers in the wheel cylinders and keep air from entering the line while relining hydraulic brakes. Below, when removing a headlight lens of the rimless type that requires pressure to loosen it, it's a good idea to keep a piece of inner tube over the hands in case the glass should accidentally shatter



Above, this oil-gauge wiper consists of two metal disks, a stovebolt, a spring and two renewable felt washers. The gauge rod is drawn through the wiper, the oil being absorbed by the felt, which can be squeezed to eject accumulated oil. Circular insert, to cut holes neatly in radiator hose for better connections use a punch made by grinding down one end of a spring-eye bushing of the right inside diameter. In use you slip a piece of wood inside the hose, tap the punch sharply and a clean-cut hole results

Tray Clamped under Headlight When Changing Bulbs

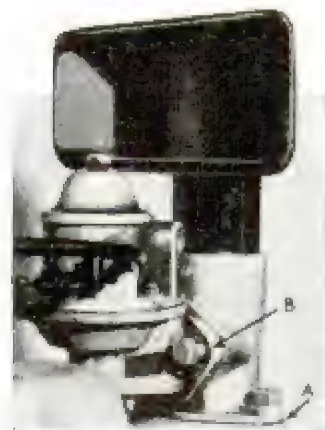


Canvas tray clamped to headlight bracket catches lens or bulb if it accidentally drops from the hands

To avoid breaking a lens or bulb by having it accidentally slip out of his hands when working on a headlight, one mechanic uses a canvas tray, which clamps to the lamp bracket as indicated. The tray is made by sewing canvas over a steel-wire frame, and not only helps avoid breaking lenses, but serves as a place to put the parts when taking the headlight apart.

Two Ways of Raising Fuel Pumps to Reduce Gas Consumption

On many cars that do not have to be driven at top speed, a reduction in fuel-pump pressure may aid in saving gasoline. Raising the pump $\frac{1}{16}$ in. will usually reduce the pressure enough to give good performance and effect some economy. Where fuel pumps are mounted as shown, the easiest way to raise the pump is



to insert gaskets at A. But where the installation differs from this, the same result may be had by filing out the hole indicated by B to let the pump come up $\frac{1}{16}$ in.

Then with a screwdriver under the pump flange prying the pump up, tighten the cap screw. The latter method is preferred by many mechanics as it allows easy alterations of pump pressure while road-testing the car.—C. E. Packer, Chicago.

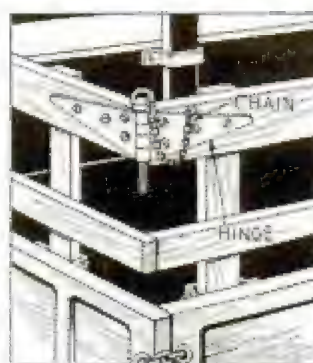
Emergency Skid 'Chains' Are Cut from Old Tire

Emergency skid chains can be cut from an old tire. With a hacksaw and a sharp knife, cut out sections as indicated and provide them with leather straps. The chains are easy to put on or take off the wheel, and they do not wear rapidly or make undue noise when driving on pavement.—B. Busby, Des Moines, Ia.



Corner Iron for Truck Endgate

Here is an inexpensive corner iron for a stake truck body that keeps the endgate attached securely.



It is an ordinary strap hinge 8 or 10 in. long with a machine bolt substituted for the hinge pin. A small hole is drilled transversely through the bolt head and a light chain is attached to it and fastened to the body to prevent loss of the bolt when the endgate is removed.—Harold Everett, Swanton, Ohio.

Carburetor Should Be Checked After Installing New Rings

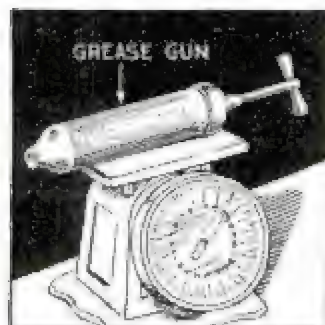
After installing new piston rings, always check the carburetor as the previous mixture probably is too rich for the improved compression and vacuum. When the mixture is too rich, the excessive amount of raw gasoline will wash the oil off the rings

and cylinder walls, causing rapid wear of the new rings. High float level, worn jets, worn float valve and over-choking also cause this condition.

Finding Elusive Rumble in Car

Some of the late-model cars develop a rumble that is not only annoying but is often hard to locate. There are two sources that cause the trouble usually, the most common one being vibration between the rear-spring leaves. This trouble can be prevented by adding two more clips to each spring, spacing them equally between the ends of the springs and the housing. The other cause of rumble, is worn spring bushings and shackles, which can be eliminated only by replacing the worn parts.

Weighing Grease Gun to Show How Much Grease Is Used



To determine how much grease is used on a job, one mechanic weighs the gun on a pair of household scales before he starts, and then weighs it when the job is finished.

As the weight of the empty gun is known, a simple problem in subtraction shows just how much grease was used on the car.

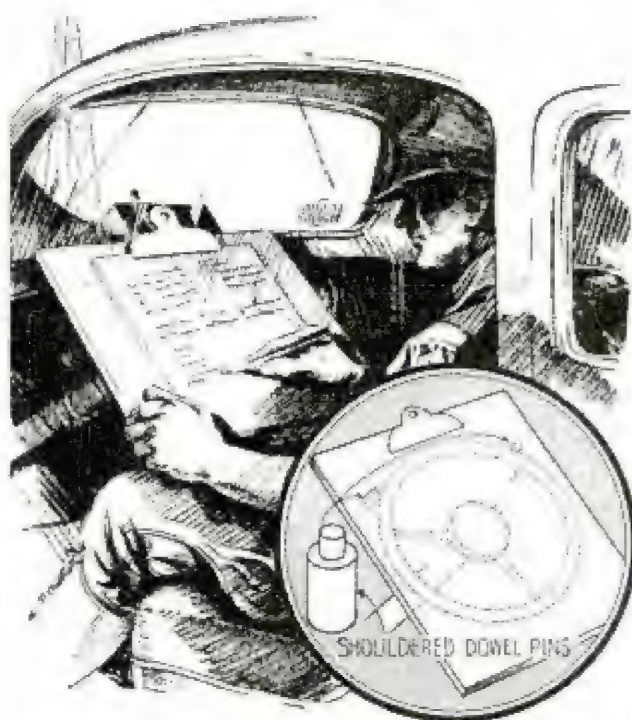
—Vernon Tracey, Centreville, N. B., Can.

Wet Cloth Substituted for Funnel

If you have to fill a car radiator with a pail, and have no funnel at hand, try using a wet cloth as shown. The free end of the cloth is twisted to a point so that the water flows off it in a small stream. This method is especially handy when filling a radiator outdoors where even a slight breeze tends to spray the water over the hood of the car.



Steering-Wheel "Writing Desk" for Your Car



When writing while in a car, just set this clip board over the steering wheel for a desk

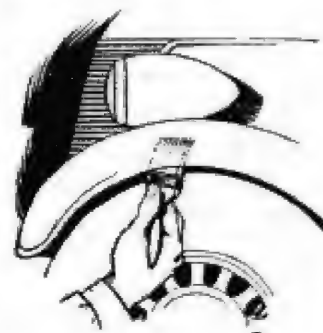
One engineer who had to take notes while in his car found that by placing short dowels on the underside of a clip board so that they would hook over the steering wheel, he had a "writing desk" when needed. The dowels are glued in place, short tenons extending through holes bored in the clip board.

—Lester P. Young, Culver, Ind.

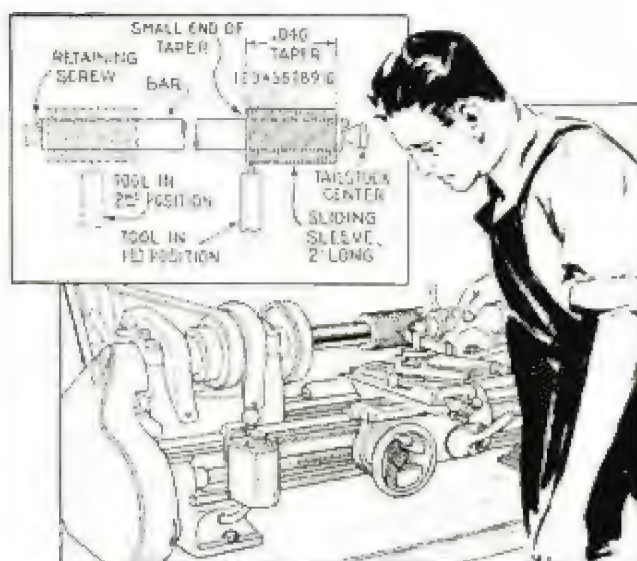
Protecting Underside of Fenders

A semi-hard plastic that will protect the undersides of fenders against rust and dents caused by small stones thrown against them from the tires, is made by melting old inner-tube rubber, 1 lb., and then mixing it with asphalt, 4 lbs. Apply a heavy coat of the mixture to each fender with a brush. It's a good idea to cover the wheels and tires while applying the mixture to keep it from getting on the wheels.

—A. H. Waychoff, Tempe, Ariz.



Lathe Centers Tested Accurately with This Tool



This tester will check accuracy of lathe centers to one-thousandth of an inch

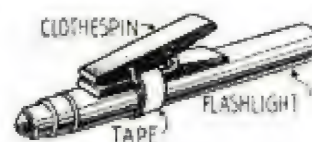
Here is a tool with which you can test lathe centers accurately. It comprises a bar and a tapered sleeve 2 in. long. A 10-per-inch thread is scratched lightly on the sleeve, after which the threads are numbered from 1 to 10. In use, the bar is

placed between centers and, with the sleeve at the tailstock end, a tool point is fed in until the sleeve touches it at some figure as it is slid along the bar. This figure is noted and the tool is moved over to the headstock end. Then the sleeve is slid along the bar until it touches the tool again. If, for example, the tool touched thread four at the tailstock end and ten at the headstock end, the center is out .006. A small screw at each end of the bar prevents the sleeve from coming off.

—H. Moore, Hamilton, Ont., Can.

Clip Holds Flashlight on Car

The convenience of a flashlight in your auto can be increased by providing it with a clip, so that it can be attached to any part of the car, leaving both hands free to change a tire or to inspect the motor. If the flashlight is of a small or medium size, an ordinary spring-type clothespin taped to it provides a good clip.—Kenneth Murray, Sturgis, Mich.



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Jack Cottrell, 1937 Pacific Coast 80" Tourist Trophy Champion, rides a Harley-Davidson.



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☐ 31 years and up. ☐ under 16 years.
Check your age group.

Solving the Riddles of Crime

(Continued from page 573)

gun from which any bullet was fired. If a suspected weapon is found and a test bullet is fired into a container of cotton, the bullet comparison microscope quickly reveals whether the test bullet and a fatal bullet were fired from the same gun.

The microscope also is a necessity in examining and identifying suspected blood stains. With the aid of the microscope, chemical tests reveal whether a stain was made by blood and further tests reveal whether it was made by human blood—often a point of controversy.

The microscopic analysis of dust particles found on shoes, in clothing and even in the wax of human ears often aids in solving crimes. In one case, a garment was

sessed no such hair or clothing and this, and other evidence, won her a divorce.

The microscope and metallographic analysis helped solve a Wisconsin murder. A man received what he thought was a be-lated Christmas parcel. He opened it as his wife stood by. As he cut the string which bound it, there was a terrific explosion which killed the woman and injured the man. Among pieces of the bomb found were three metal parts, a trigger or release mechanism consisting of a flat piece of steel, and two metal rings, one apparently cut from a three-quarter-inch pipe coupling and the other from the end of a similar pipe.

On the farm of a man suspected of the crimes was found a gas engine with a homemade release mechanism much like that of the bomb. Had the two triggers come from the same piece of steel? The two pieces were given a positive and quick test used in the laboratories of the metal industry—metallographic analysis, a system in which the crystal structure of a specimen is revealed and studied with the aid of the microscope. The crystal structure of a piece of metal is determined by chemical composition, heat treatment and mechanical treatment. Even a little variation in any of these factors alters the crystal structure, so the expert knows that if two pieces of steel show identical crystal structure, they must be of common origin.

First, the two specimens were polished, then examined carefully for slag inclusions because, should one show such inclusions and the other show none, they could not be from the same piece. Both showed large inclusions of slag, indicating they came from a cheap grade of steel. Next, the polished surfaces were etched for the same length of time with a chemical. Since steel is an alloy made up of minute crystals of different chemical composition, the various types of crystals react distinctively to a reagent; hence, after etching, the size, shape and character of the various crystals can be viewed through the microscope.

And microscopic examination not only revealed the same crystal structure in each piece, but a most unique one consisting of types of crystals which had never before

(Continued to page 116A)



Small quartz spectrograph used for detection of metallic poisons in blood or viscera

found at the scene of a crime. It was placed in a paper bag and beaten. The dust showed many pulverized woody fibers and it was concluded that the owner of the garment was either a carpenter, a wood cutter or a joiner. When dust also disclosed the presence of gelatin and powdered glue, it became evident that the clothing belonged to a joiner. Later this was found to be so.

A woman seeking a divorce once used vacuum-cleaner sweepings as evidence. Microscopic examination revealed someone with artificially curled and bleached hair, wearing a blue sweater and garments of loaded silk colored deep blue had been in the home. The wife claimed she pos-

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SHUTTER . . . Compur-Rapid, 9 speeds to 1/400 second.

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Your lens may be the new Kodak Anastigmat Special *f*.4.5; shutter, a Compur-Rapid. Advanced refinements include folding eye-level finder, body shutter release, one-finger bed release for quick closing. Case and back, aluminum; covering, pin-seal grain leather.

KODAK SPECIAL SIX-20, for pictures $2\frac{1}{4} \times 3\frac{1}{4}$ inches: with Kodak Anastigmat Special *f*.4.5 lens, 1/400 Compur-Rapid shutter, \$45; with Kodak Anastigmat Special *f*.4.5 lens, 1/200 Kodamatic shutter, \$37.50; with Kodak Anastigmat *f*.4.5 lens, 1/200 Kodamatic shutter, \$33.

KODAK SPECIAL SIX-16, pictures $2\frac{1}{2} \times 4\frac{1}{4}$ inches: Kodak Anastigmat Special *f*.4.5 lens, 1/400 Compur-Rapid shutter, \$48.50; with Kodak Anastigmat Special *f*.4.5 lens, 1/200 Kodamatic shutter, \$41; with Kodak Anastigmat *f*.4.5 lens, 1/200 Kodamatic shutter, \$36.50. Eastman Kodak Co., Rochester, N.Y.

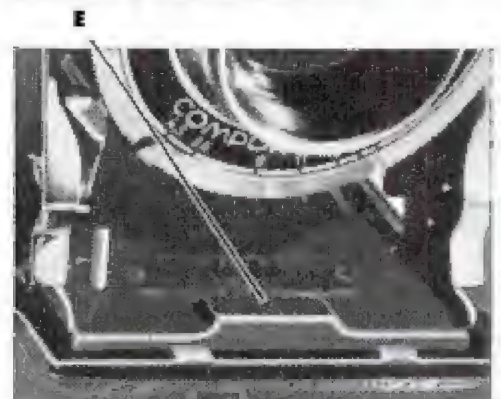
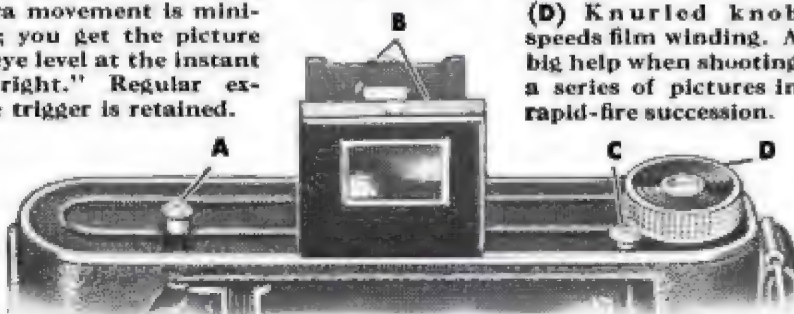
(A) Ingenious new body shutter release. You hold the camera firmly in both hands, sight through the optical direct-view eye-level finder, and release the shutter with a light touch of the finger. Camera movement is minimized; you get the picture from eye level at the instant it's "right." Regular exposure trigger is retained.

(B) Optical direct-view eye-level finder; opens with a quick flip of the finger; folds flat to camera body when not in use.

(C) Press this button, and the camera pops open—pull down the bed and the lens snaps out into picture-taking position.

(D) Knurled knob speeds film winding. A big help when shooting a series of pictures in rapid-fire succession.

(E) The one-finger bed release, another new camera feature, which allows the camera to be closed in one quick, simple operation.



ONLY EASTMAN MAKES THE KODAK

New KODAK SPECIAL SIX-20

(Continued from page 114A)

appeared in the examination of thousands of steel specimens. By a similar test, the two metal rings were proved to have come from pipe found on the suspect's farm.

Because each element has its own peculiar light radiation, spectrographic analysis enables the criminologist to detect such metallic poisons as copper, lead, arsenic and antimony. The spectrograph is an optical instrument which breaks up light into its constituent wave lengths and provides a measurement of these lines on a plate negative. Chemical analysis in-

contained in a preparation for the complexion. The arsenic in the stomach, however, was shown to be in distinct crystals.

An instrument receiving attention from laboratory experts is the fluorescence microscope. The principle involved is the fluorescence and the changing of certain substances under exposure to ultraviolet light. Altered documents sometimes are exposed by the fluorescence microscope which may disclose a difference in the inks or paper. In one case, it was claimed a document was written in 1868 but an examination of the ink showed it was made from a dye not discovered until 1874.

Secret messages literally can be hidden between the lines of an ordinary typewritten letter by dipping the pen in one of many substances which are later made luminous by ultraviolet light. Raised checks, alterations of bonds and changes in notes and wills are easily detected with the aid of the fluorescence microscope which shows dissimilarities between the authentic and spurious portions of a document. The business man can protect himself against forgeries by using a few drops of a chemical solution in the ink with which he signs checks and documents since the fluorescence peculiar to that solution will be disclosed under ultraviolet light.

It is possible for the reaction of drugs under ultraviolet light to point to a suspect. In one instance, the only evidence found near the body of a murder victim was a strand of hair obviously alien to the head of the slain man. There were three suspects. Microscopic cross sections revealed close similarity between the evidence and the hair of all the suspects.

But when ultraviolet light was applied to the lone hair, the purple luminosity of aspirin appeared. A hair taken from the head of one of the suspects showed the same fluorescence while it was absent from hairs taken from the other two heads. The man, whose guilt was established by additional evidence, was a regular user of aspirin which had reached his hair through the perspiration glands.

Thus man, aided by the microscope, is solving crimes today on such slim and seemingly insignificant evidence as a single human hair, the die marks in a tiny nail, the dust extracted from a coat or the similarities in the markings of two bullets.



Using microscope in attempt to identify spot or stain on a handkerchief

volves a search for suspected traces while spectrographic analysis immediately reveals all the metals present.

Arsenic, the oldest of criminal poisons, occurs usually as a white powder, somewhat gritty, and but slightly soluble in water and common liquids. The microscope reveals it as brilliant crystals with more or less triangular faces and, because of its slow solution in body fluids, portions of it may remain for hours in the stomach without losing the telltale crystalline form.

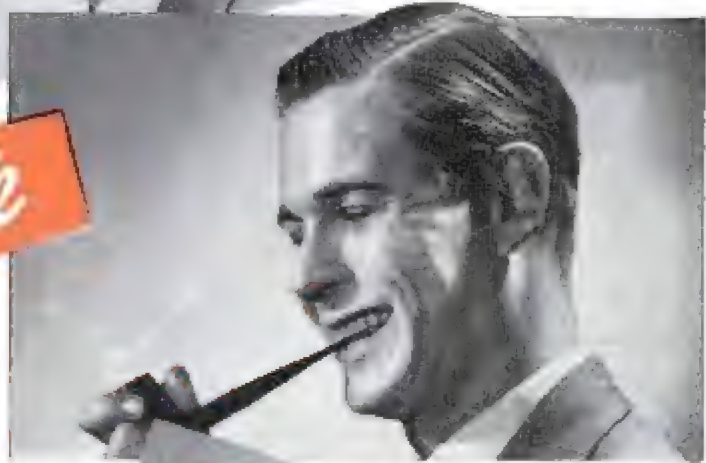
Several grains of arsenic were found in the stomach of a Philadelphia woman who had died under suspicious circumstances. Her husband was accused of poisoning her but the defense maintained death had been caused by arsenic in a pulverized form

George Brent, Movie

Don. Allen



all the



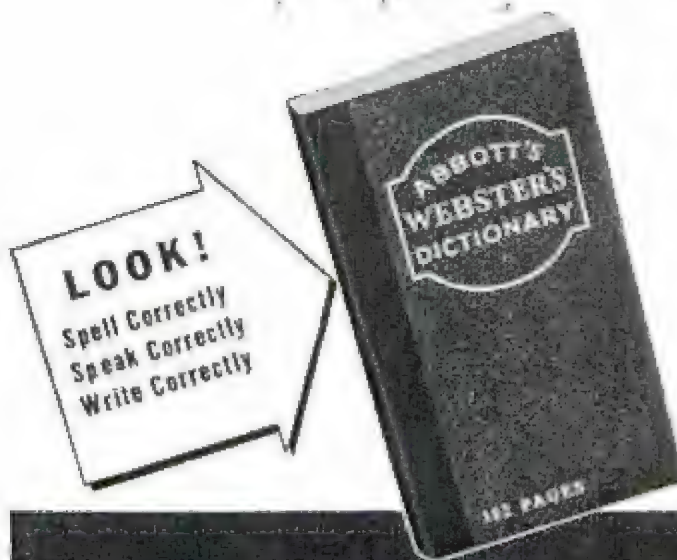
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(Continued from page 118A)

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radio telegraphers, these men are the only ones employed by the networks who must be government licensed radio engineers. Usually little excitement mars the routine of checking high-voltage equipment although a couple of them swallowed hard one day when two girl endurance flyers passed between the antenna towers in a fog, narrowly escaping crashing into them. Occasionally one of them performs a really heroic act. The chief engineer of a Canadian station climbed a 200-foot ice-coated tower in a sub-zero gale to restore his antenna which had broken from the weight of ice. But for sheer courage, a Chicago engineer probably is tops. He slipped on rubber gloves, plunged his hands into an



John Dyer at radio controls which brought the world news of the Admiral Byrd expedition

oil-insulating tank and held two 7,000-volt leads together so the speech of a President might proceed without interruption.

The engineers with which the public is most familiar are the studio or "booth" operators, the chaps you see peering out from behind the control windows when you visit a studio. Some radio stars will not face the "mike" without their favorite engineers at the controls because they believe one man alone has mastered the split-second timing and the fine blending of voice, orchestra and sound that goes to make the perfect production.

Even presidential candidates have their preferences in radio engineers—preferences responsible for sending Clyde Hunt, chief engineer of WJSV, Columbia's Washington key station, on more than 75,000 miles of travel with President Roosevelt from the time of his nomination in 1932 until his second inauguration in 1937. In like manner former Gov. Alf Landon of Kansas would not start a speech during his campaign until he received the "all's well" signal from his personal engineer, young Charles Warriner.

Unsung are the praises of the men who hold radio's drab job—maintenance. Each night they check each piece of equipment to forestall possible failure, just as the humble trackwalker plays his important role for the railroads. All night long they trudge from studio to studio, checking mikes, controls, tapping tubes, looking over signal lights, shaking and rattling cables and plugs, polishing sockets and correcting clocks. In the daytime others check the remote equipment used for picking up programs originating outside the studios. And of course they also build and repair much of the equipment used in the studios.

Real engineers of the slide-rule kind are the research men who spend their time in the laboratories experimenting with ultra-short waves, television, high-fidelity equipment, improved studio acoustics and other advanced fields for radio research. In this group are one bunch of experts who do nothing but listen to broadcasts. They are the field-strength surveyors who ride from one end of the country to the other in cars fitted with specially built equipment for recording the signal strength of the various stations.

The average age of these miracle men of radio is about thirty-two. Their hearing is more keenly developed than any other class of men and experience has shown that they think faster, act faster and are more dependable in emergencies than most men.

And most of them are so steeped in radio that they no longer are able to take it or leave it alone. Their days off are typical postman's holidays—spent beside a "ham" transmitter contacting other "addicts" the world over. They modestly disclaim the title of miracle men, but without them we should not enjoy the miracle that is radio itself.



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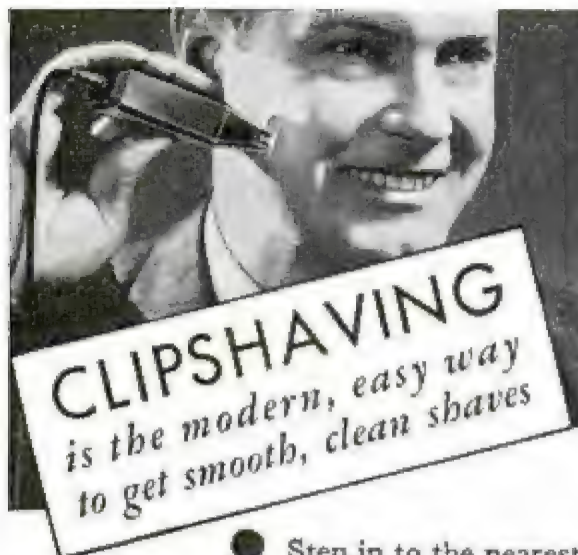
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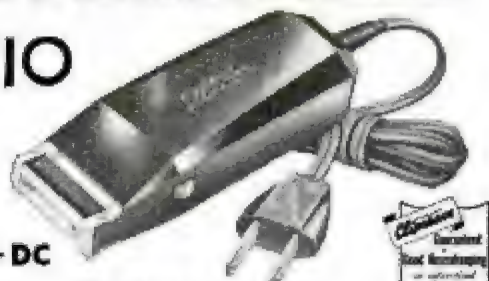
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Running World's Greatest Bridge

(Continued from page 549)

Breaking another glass dial on the call boxes sounds the fire alarm and brings a fire truck dashing to the scene. The fire engine is equipped to fight every conceivable type of fire. Recently some packages in a delivery truck caught fire and to save time the driver kept going until he reached the fire station where his fire was put out. One out of every 1,100 cars, or about one per hour, develops trouble on the bridge. Traffic accidents resulting in personal injuries involve one out of every 117,000 cars crossing the structure.

With its towers rising 500 feet above the water this bridge has to warn airplanes away. Six 1,000-watt red revolving airway obstruction beacons on the towers and



Showing "catwhisker" which short circuits static electricity from car to bridge

several smaller code beacons warn pilots from flying too closely. Each pier is protected at the water line by clusters of lights to keep ships away, and vertical strings of lights hang from the center of each suspension span as a guide so that ships can steer safely under the bridge. All of the navigation lights are turned on and off automatically by an astronomic time clock. In foggy weather the center anchorage in the middle of the ship channel is guarded by the strokes of a one and a

Joll Dergeant G. J. Borden

half ton bronze fog bell. The other piers sound coded sirens and smaller bells. All of these operate automatically.

Every part of this lighting and fog system must always operate when it is needed. To guard against trouble the electricians stand watch before a huge control board in the administration building. The twenty-six-foot panel contains a scale drawing of the whole bridge and its electrical systems. Six hundred small indicator lamps flashing red, green or orange tell the electrician on watch the condition of every circuit. Separate indicator lights flash on and off for every revolution of each airway beacon. Other lights twinkle each time a fog horn or fog bell sounds. As a final check the electrician can throw switches that energize microphones at each bridge pier so that he can pick up and hear for himself the voices of the fog signals.

From this switchboard, also, are controlled 1,077 sodium vapor lamps that light up the miles of bridge roadway and its approaches. This orange fog-piercing illumination permits normal driving speeds in the frequent fogs. Even in extremely dense fogs, when shipping is tied up and traffic ashore creeps along at five or ten miles per hour, speeds of thirty-five miles per hour can be maintained safely on the bridge. This orange light, however, is not used at the toll plaza because its monochromatic illumination makes pennies look like dimes. Ordinary white lights are used there so the toll collectors can make the right change.

On stormy winter nights most motorists cross the bridge at reduced speeds because of the eerie feeling they receive as the bridge sways under the impact of the wind. In gales of fifty or sixty miles per hour the bridge is designed to sway as much as eight and one-half feet and at high driving speeds this sway sometimes makes a car seem to skate back and forth along the highway.

The bridge is owned by the state of California and is part of the state highway system. If anything should ever happen to it the state would be able to collect up to \$44,000,000 in insurance. All ordinary kinds of protection are covered in this huge policy and the bridge is also insured against damage caused by strikes or wars, fires, earthquakes, explosions, currents or tidal actions, floods, and ice. There is not

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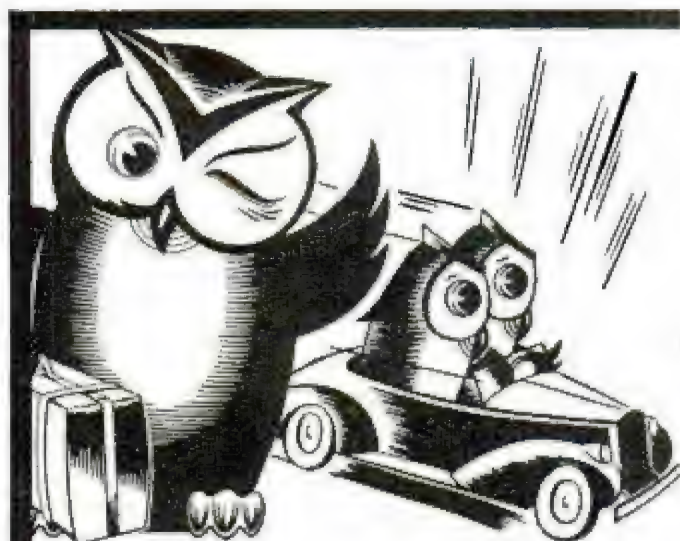
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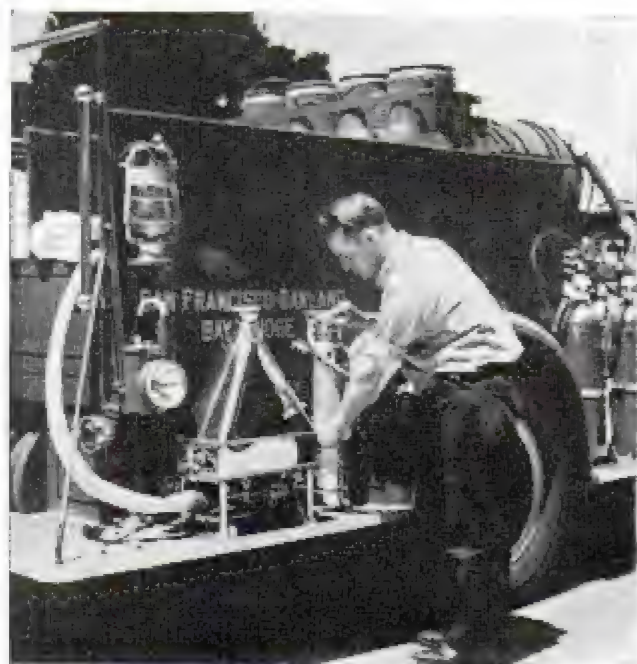
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much chance of a falling meteor striking the bridge or of it being destroyed by a waterspout, but both possibilities are covered. Even piracy is provided for in the policy. To date the bridge has withstood one severe earthquake without damage.

One of the big maintenance jobs is painting the bridge, but a complete painting will be necessary only every five or six years. A full coat requires about 300,000 gallons of aluminum paint.

To engineers the bridge really consists of three separate bridges instead of a sin-



Modern fire engine equipped to fight every kind of fire that might occur on the bridge

gle unit. The two miles of open water from San Francisco to Yerba Buena Island are spanned by twin suspension bridges that come together at a 335,000-ton central anchorage of steel and concrete. This anchorage contains more concrete than the Empire State building and is 500 feet high, half of its height being below water. The towers of the suspension spans rise as high as 519 feet above water to support the two cables that each contains 17,464 individual strands of wire. From bedrock each of the four towers is more than 700 feet high and compares with a sixty-story skyscraper. The two traffic decks are suspended from the cables and in addition to the lanes now in use have provisions for two lines of electric railway that are under construction. Split rails are to be used on the interurban system to take care of expansion and contraction. The San Francisco cable an-

chorage consists of a huge buried monolithic block containing 68,000 cubic yards of concrete. At the anchorage each cable is split into numerous smaller strands and each strand is attached to a steel eyebar anchored in the concrete. This anchorage and all of the others are to be guarded by electric eyes so that no unauthorized persons can approach the cables without giving off an alarm. At Yerba Buena Island the bridge is carried right through the hill in a double-decked tunnel that is the largest bore tunnel in the world, being fifty-eight feet high and seventy-six feet wide.

From this island to the Oakland shore the bridge consists of one main cantilever span 1,400 feet long with two 510-foot anchor arms, together with a series of nineteen truss spans. The cantilever unit itself is the largest of its type in the United States. When this part of the bridge was being completed a public celebration was scheduled but an unforeseen occurrence spoiled the speeches. At the last minute one side of the bridge was found to be longer than the other side. The workmen were unable to drive their rivets through the holes. The hot sun had expanded one side of the bridge four inches, while a cold wind coming off the bay had contracted the other side. A few hours later when the bridge was at an even temperature the holes met and the rivets were driven.

The San Francisco-Oakland Bay bridge, including the island crossing, is four and one-half miles long. The length of the whole project, including approaches and the interlacing roadways at each end, is eight and one-fourth miles. More than 30,000,000 vehicles per year can pass over it without congestion. It was built in forty months and is expected to pay for itself in twenty years.

Today, instead of having the largest bridge in the world, San Francisco can boast of the two largest. In May the 8,940-foot Golden Gate bridge spanning the entrance to the bay was opened to traffic. This suspension bridge is the largest of its type and is second to no other bridge in the world except its neighbor around the corner of the harbor.

☐ Whenever you find that you wish to know more about any article in this magazine, write our Bureau of Information, inclosing return postage.

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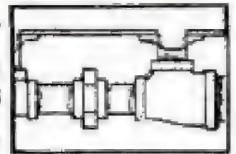
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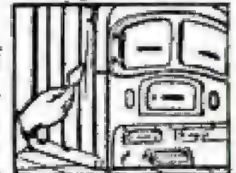
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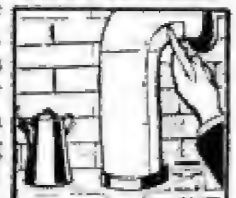
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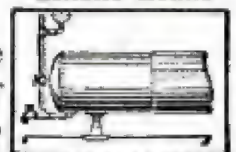
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Magic Lantern Talkies

(Continued from page 533)

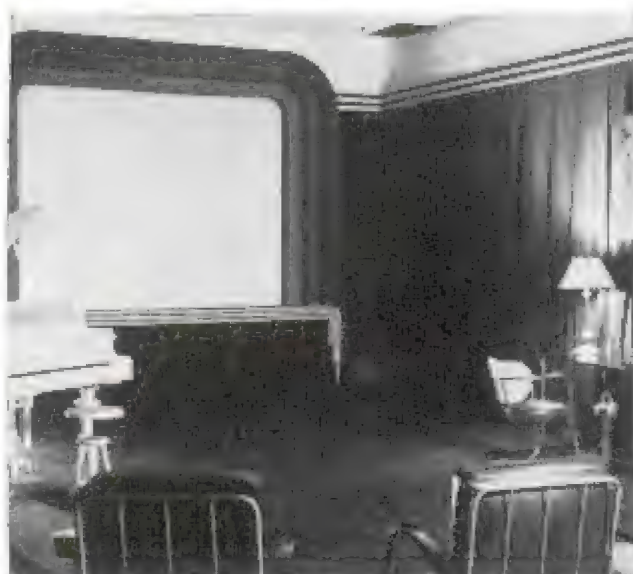
travelogue, produced from your vacation
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ment, on a record, is increasingly popular
among amateurs.

"Frozen jaw" is the one blunder the
script writer has to avoid. That is the



Synchronizing pictures with scenario is last operation
before reproducing photographs on strip film

name this baby industry gives to the slide-
film that shows an unchanging, expres-
sionless face on the screen while the char-
acter's voice speaks from the wax record.
But skilful producers are overcoming the
natural limitations of still-picture pro-
grams and making use of their natural ad-
vantages to build a new big business
around the almost forgotten magic lantern.



Projection room in studio of a slide-film producer,
where completed production is shown to customer

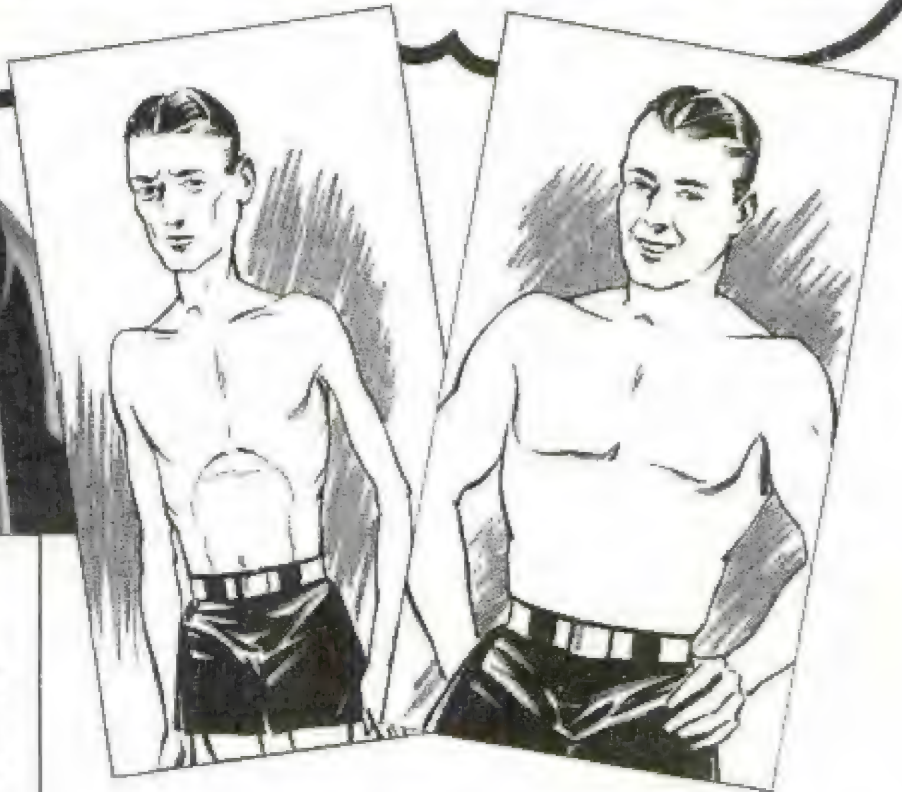


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The Wonders of a Lost Empire

(Continued from Coloroto Section)

cotton fabrics which were the envy of the Spaniards, they created beautiful pottery which has withstood the ravages of time, they engaged in picture-writing, carving and modeling in clay and even erected observatories to watch the stars and add to their knowledge of astronomy.

But, as the population continued to increase, conflicts arose and internecine struggles for supremacy finally ensued. Quarreling tribes imported outsiders to help fight their battles and the aliens eventually gained the upper hand. When the Spaniards arrived in the sixteenth century, Maya culture was on the decline. And the Spanish, with barbarous cruelty, finished

in erecting the great pyramids, temples and palaces which are huge, even when compared with present day structures. It is almost impossible to visualize the amount of labor expended in the construction of even one of these ancient buildings because we think in terms of processes dependent upon the use of metal tools, machinery, explosives and mechanical means of transportation. But the Mayas were equipped with nothing more than determination and their hands. From trees and rocks they must have fashioned the few crude tools employed and with these they hacked and beat the face of nature into a materialization of the things their imagination conceived.

Let us consider the amount of labor in building just one structure, the Temple of Warriors at Chichen Itza, for example. This is perhaps the most beautiful example of Mayan architecture known and graced their largest city. It rests upon a pyramidal foundation thirty-seven feet high and 136 feet square at the base. The heart of the pyramid is of masonry faced with cut stone. The foundation rises in four retreating terraces, each of the vertical parts of the terraces, except the topmost one, carrying a richly sculptured frieze consisting of eagles, jaguars and warriors.

A steep stair ascends the pyramid, leading to a broad terrace fronting the temple portal. Massive feathered serpent columns, with heads on the ground and tufted tail-rattles rising fifteen feet above, divide the temple entrance into a triple doorway. In front of this awe-inspiring portal is a reclining human figure, life size, carved in limestone. Inside the temple is a great hall, sixty feet long, more than thirty feet wide and originally more than twenty feet high, its beautifully arched roof supported by sculptured columns painted with figures of warriors. This hall gives access to a sanctuary just as large and as richly decorated, containing an altar or throne resting on painted statuettes, carved in the likeness of human beings. Originally the inner walls were covered with fine sand plaster brilliantly colored with scenes depicting domestic life, the battlefields and religious ceremonials.



The Old Empire of the Mayas was at the base of the Yucatan peninsula; the New Empire was established to the north

it. The Mayas were driven from their palaces and temples. The remnants took refuge on an island in a lake to the south. The Spaniards followed them there and defeated them. Those who escaped death or subjugation fled to the jungle and today their descendants are almost the only inhabitants of the region but they have lost most of the cultural attainments possessed by their ancestors.

Probably the greatest mystery of the Maya civilization is how they succeeded

(Continued to page 130A)

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The Wonders of a Lost Empire

(Continued from page 128A)

The pyramid and temple originally weighed more than 84,000,000 pounds, it has been estimated, about as much as the "Ile de France," ocean greyhound of the French Line. Assuming a man can carry an average load of 100 pounds, this weight represents more than 840,000 man-loads of stone.

And carrying the stone was the simplest part of the whole undertaking. The cutting and carving of all the intricate designs and figures must have represented years of tedious effort with crude stone or wooden tools.

Beneath the Temple of Warriors was found another building which had been dismantled and filled in to serve as a base for the later structure. The Mayas had built one great temple, only to aspire to a greater one and had used their earlier handiwork as a base for the later!

Such feats of daring in any people indicate untold patience, perseverance and determination as well as highly effective organized effort. These attributes the Mayas possessed in abundance. The tribes were organized as limited monarchies, with hereditary royalty and with advisory councils composed of the heads of the most important families. There was a separate military caste attached to the governing body, and a system of slavery. And, last of all, their priests exerted a tremendous influence.

But even with such organization and with an entire populace under the yoke to provide man power, the feats of the Mayas still seem impossible when we consider that they accomplished everything they did with nothing more than their bare hands and a few stone and wooden implements.

How did they do it? Investigators who have unearthed and restored some of the magnificent structures of the Mayas today supply part of the answer to that question.

(Concluded next month)

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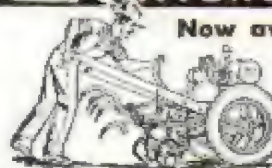
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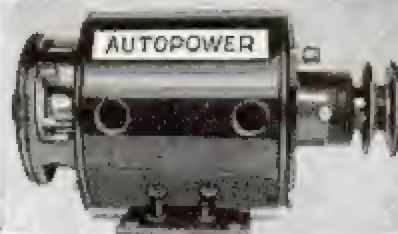
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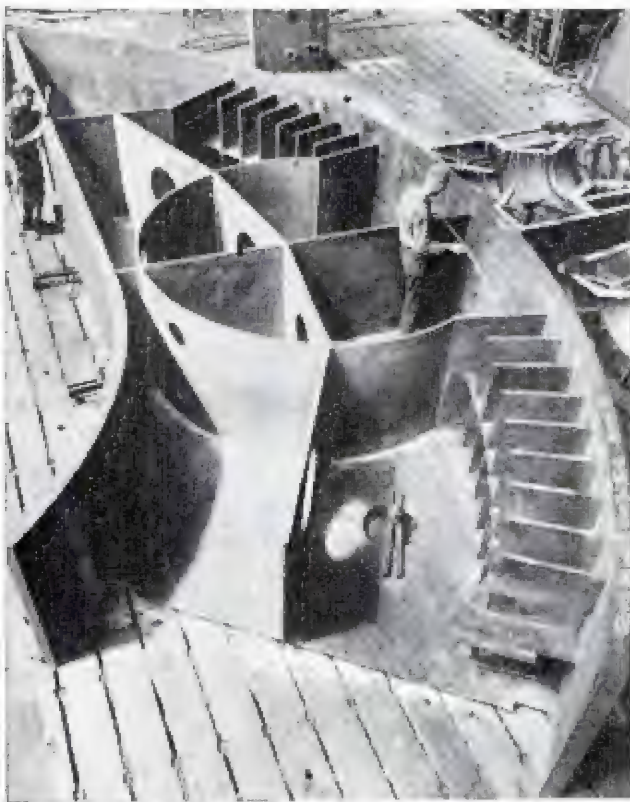
A Million-Pound "Eye"

(Continued from page 541)

and one-half feet wide made of steel three and one-half inches thick in order to maintain stiffness. The other end of the yoke is shaped as a flat swivel and has a single bearing—a ball and socket seven feet in diameter.

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torque of only about fifty foot-pounds at the operating speed of one revolution per day. The smallness of this friction can be realized when it is found that the telescope can be kept rotating by the output of about 1/165,000 horsepower. Conventional roller and ball-bearing supports would lead to a friction torque of 30,000 foot-pounds, 600 times as large as the oil-pad friction.

While the mounting has been built in sections, these sections are huge and transporting them from the Atlantic coast to the Pacific coast and up to the top of a 6,000-foot mountain is an engineering job in itself. The cage, the largest single unit, will be hauled by rail over an exclusive right of way from the Westinghouse plant



Giant roller bearing which will be used to aid in rotation of million-pound eye

at South Philadelphia to the docks on the Delaware river where loading cranes will lift it onto a ship or transfer barge. The cage finally will become the deck load of some steamer to be delivered to San Diego.

From San Diego all parts must be transported over sixty or seventy miles of road to Mount Palomar.

One of the first tasks of the engineers in planning the mounting was to build a model to one thirty-second scale of the complete assembly. No one will know whether this million-pound colossus has a nut missing or a bolt hole out of line until it is assembled. But the men who designed and constructed the greatest precision instrument ever conceived are willing to wager that it will work just like the little \$2,000 celluloid model they played with before they started to build it.

Going to the Dogs

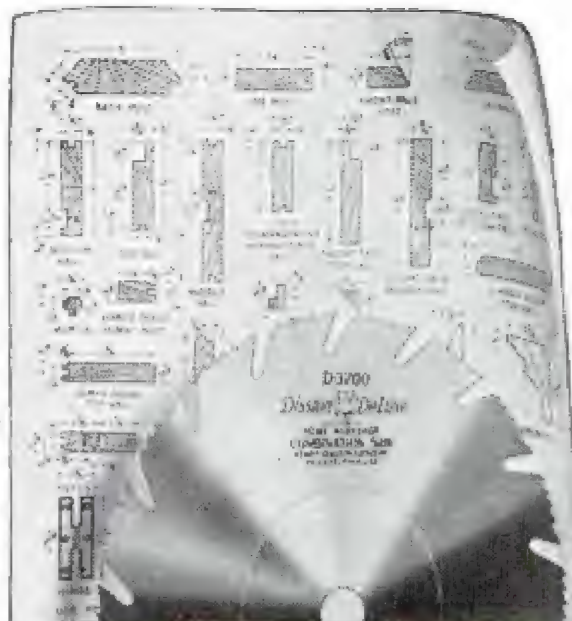
(Continued from page 517)

means that dog training is becoming a highly profitable profession. Hundreds of kennels now employ trainers, frequently at high salaries. Training begins in early puppyhood, is under good headway by time the animal is six months old, and approximately finished by the third year. Reward, rather than punishment methods are almost invariable. Show dogs, watch-dogs and frequently hunting dogs are trained in obedience to the spoken command and in human company. Sheepdog training is usually by whistle tones and livestock dogs are kept away from human company as much as possible. The pup is taught a code of whistle tones, each one meaning a different command—stop, turn, lie down, round in, etc. Turns and directions are indicated by hand or arm motions by the shepherd or trainer.

Breeding stock is being imported into this country from herding strains of Scotland, Wales, Australia and New Zealand. Sheep-herding trials or tests are now becoming annual events in various livestock growing sections. "Old Spot," a black-and-white collie, winner of the trial of the International Sheep Dog Society and imported by S. S. Stoddart, of Bradford, N. H., was sire to more than 100 of the most valuable sheepdogs in the United States. Mr. Stoddart paid \$1,000 for "Old Spot."

Intelligence and training, rather than breed measurements, also are important in deciding value of retrievers, setters, spaniels, and other sporting dogs. Several recent retriever trials have been won by dogs which fail to measure up to formal breed standards. Strictly non-working breeds such as terriers, "toys," like the Maltese, Pekingese, pomeranians, etc., and non-sporting dogs, including bulls, Dalmatians, chows, schipperkes, keeshonden and poodles, are also expected to meet the new standards of obedience. The official obedience tests is a stiff one. To qualify, any dog must be able: To "heel" or follow on leash; to heel free of leash; to come when called; to retrieve a dumbbell or other object; to "speak" or bark on command; to make a long jump; to sit for a period of three minutes; to lie down for five minutes.

The kennel club has just completed a se-



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New! The Disston DeLuxe is the finest home workshop saw you can buy. Disston steel! Disston workmanship, of the highest standard! On any job you do, Disston DeLuxe means easier cutting. On something that is a real challenge to craftsmanship, you will realize that the easy, accurate cutting of this fine blade is the beginning of fine work.

Ask your dealer for this saw by name: "Disston DeLuxe", etched on the blade. See the high, smooth finish... accurate fitting... keen teeth, that hold their cutting edge. Ownership of a Disston DeLuxe Saw is of itself inspiration to build pieces of which you can be proud.

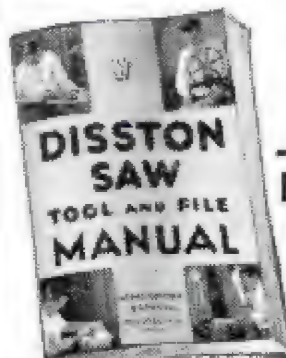
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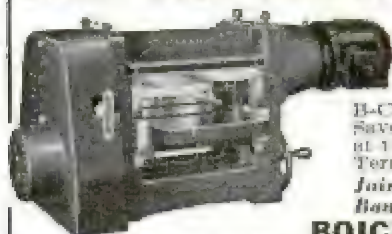
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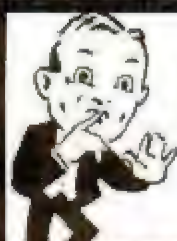
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WAIT

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Atlas WILL ANNOUNCE SOON

... two amazing new developments in machine tools ... watch for complete details next month.

ATLAS PRESS CO.
KALAMAZOO, MICHIGAN

ries of obedience tests of various common breeds. First place was won by the poodle. Poodle scores averaged 652 points. Next came the Doberman pinschers with a score of 264. German shepherds came third with a score of 200; Great Danes fourth with a percentage of 181. The fox terrier, Newfoundland, chows, schnauzers, Irish terrier, Irish setters, keeshonden and Chesapeake Bays also won obedience honors.

Commercially, New York is probably the world's doggiest town with Chicago close behind. The two cities license or assess more than 2,000,000 dogs and their expenditures per dog set an all-time high.

Nowadays American cities have dog doctors, surgeons, hospitals, barbers, mani-



Champion Windsweep "Ladysman," best cocker spaniel and best spaniel in one show

curers, attendants and exercisers, stores and costumers, even perfumers! American Express figures indicate an average of 11,000,000 dog train-rides every year. Scores of great city department and sporting-goods stores maintain dog shops or departments. One New York department store sells more than \$3,000,000 worth of dog goods a year and five national chain stores list dog accessories among their first ten novelty lines. Dog medicines and supplies are stocked by more than 300,000 American drugstores and dogs are being sold from at least 62,000 pet-shop kennels and other merchandising establishments.

The modern dog shop is a revelation. Beginning with dog beds and mattresses, dog houses and dog chinaware, its stocks include hundreds of styles in harnesses, leashes, and muzzles; rain capes, plaid jackets, woven sweaters, nobby gabardine and camel's-hair wraps, leather mittens and

(Continued to page 138A)

Blossom Wiff

New Invention WITH SUPERCHARGE PRINCIPLE SAVES GAS



AT LAST! Automotive engineers have smashed down the barriers to perfected combustion! The new VACU-MATIC solves the secret of greater power! With almost magical action, this amazing invention instantly puts new life and pep in any motor. It adds mileage to every gallon of gasoline . . . produces split-second pick-up, sensitive accelerator response, quicker starting, greater speed and smoother running.

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The self-starter — four wheel brakes — knee action — streamlining . . . and now VACU-MATIC! The sensational money-saving invention! With it, engineers have achieved a practical means of balancing air and gasoline automatically for all speeds.

VACU-MATIC is *entirely different!* It operates on the supercharge principle by automatically adding a charge of extra oxygen, drawn free from the outer air, into the heart of the gas mixture. It is entirely AUTOMATIC and allows the motor to "breathe" at the correct time, opening and closing automatically as required. No idling troubles—no carburetor adjustments necessary. It is so simple it will assure you — so practical it will save you many dollars on gas costs.

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VACU-MATIC proves itself on every car. It is guaranteed to give worthwhile gas savings, quicker pick-up, and more power or it costs you nothing. You can instantly tell the difference in added power and motor performance — you quickly notice the cash savings on gasoline.

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VACU-MATIC is constructed of six parts, assembled and fused into one unit, correctly adjusted and *sealed at the factory*. Nothing to regulate. Any motorist can attach VACU-MATIC in ten minutes. Once in, its only reminder is the surge of instant power and speed it gives to the motor and the savings it affords your pocketbook.

Free Details

You owe it to yourself to know all about this remarkable discovery. Mail the coupon below. Start saving gas with VACU-MATIC and enjoy a new driving thrill! There's no obligation — so get the facts now! Write today!

AGENTS & SALESMEN

VACU-MATIC offers a splendid opportunity for unusual sales and profits. Valuable tests turn new being assigned. Check and mail coupon.

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"On my V-8 Ford it works miracles. In added power, acceleration and top speed has sold me. The results are too believable." — Ralph E. Smith, Minn.

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"On my Plymouth I obtained an average of 22 miles per gallon, an increase of 7 of 22 miles per gallon, a saving of \$15 a month at \$180 a year." — F. S. Peck, Calif.

"It saves me one gallon a day. I had no buy 3 gallons each day—now only 4 gallons." — L. V. Sweet, Pa.

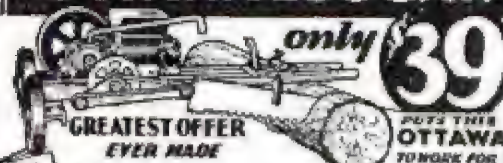
"I have twelve VACU-MATICS on cars now, and they all show an increase in mileage. The car owners are very well pleased." — Fred Taylor, Ohio.

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FREE SHOES TO PRODUCERS

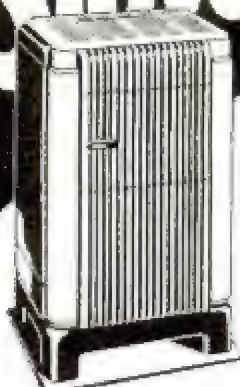
Orders roll in and every sale gives you a big profit on the famous VELVET-EEZ air-cushioned insole shoes. All you do is make a 10-second demonstration. Customers can readily appreciate this super air-cushion nailless feature. It's the best on the market at no extra cost.

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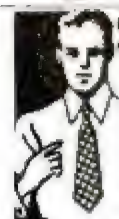
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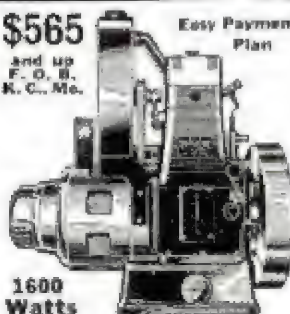
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1600
Watts

Easy Payment
Plan

Kansas City, Mo.

WITTE ENGINE WORKS

(Continued from page 136A)

fur-lined galoshes. There are more than 2,500 standard brands of dog patents and remedies, tonics, and medicines; at least a dozen brands of dog shampoo soaps, some of them perfumed. For the pampered dog there are nail files and snippers, nail polishes of all hues, hair oils, stimulators and tonics, skin remedies and anti-halitoses preparations.

Dog-tailoring is now a million-dollar industry which inspires the services of established fashion designers. One New York department store features dog garments in more than ninety styles—at prices ranging from fifty cents to sixty-five dollars.

New York's dog bath club accepts members at an annual fee of ten dollars and for additional fees, gives dog manicuring in cobalt-blue stalls; sun treatment under the most modern health lamps; umbrella-shaded naps on the landscaped roof garden; and services of a dog dentist, dog surgeon and a dog drugstore.

But dog feeding is the largest single entry. Half a billion dollars a year is an extremely conservative estimate of Fido's American dinner check. As a rule, dog feed is added to the family grocery bill and therefore a final tabulation is hard to secure. The largest chain food store reports annual sale of prepared dog foods at about \$10,600,000. One manufacturer of dog biscuits does an annual gross of more than \$3,000,000 and at least two canners of meat foods for dogs have financial ratings in excess of \$1,000,000. In prepared dog foods the largest selling items are biscuits, fresh beef, mutton and meat scraps, and canned meats, which frequently are seasoned or mixed with the latest styles in vegetable vitamins.

By nature dogs are meat eaters and dog food industries are taking closer account of this fact. Overfeeding of bread, potatoes, beans and other starch foods are now cited as cause of a great many serious dog ailments. One of the newest canine catering companies, with a business in eight leading cities and a clientele of more than 100,000 dogs, makes daily deliveries of beef and lamb in refrigerated trucks and features an all-meat dog ration prices at from a dollar to four dollars weekly per dog.

Country or kennel dogs are usually healthiest. City pets are least healthy.

(Continued to page 140A)

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Costs Only $1\frac{1}{2}\text{¢}$ PER HOUR!



An Ohio inventor, J. C. Steese, of Akron, has hit upon a discovery which revolutionizes heating costs in every home. It replaces old-fashioned stoves, and even furnaces. Gives a room full of healthful heat for about $1\frac{1}{2}\text{¢}$ an hour. Is portable. Makes and burns its own gas. Absolutely safe. Now offered on a 30-day trial right in your home, at our risk!

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Hottest Flame Known

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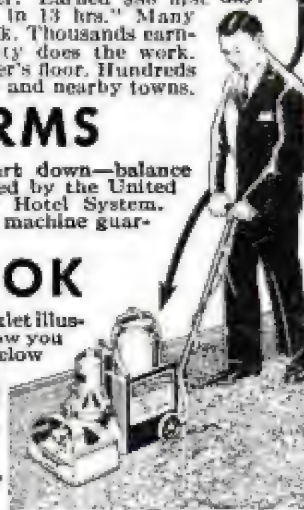


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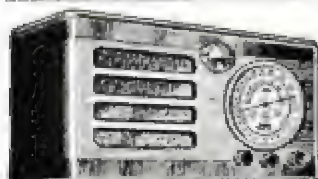


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25 beautiful models, 5 to 15 tubes, for FARM, HOME and AUTO. ONE YEAR GUARANTEE

WORLD-WIDE RADIO CO., 2868 Elston Ave., Dept. 61, Chicago, Ill.

Dollars and Scents

(Continued from page 525)

While these natural oils supply finesse, every perfume today depends on a synthetic for the character and individuality which distinguish it from every other perfume. And the chemist obtains some of the most important synthetic components for perfumes from coal tar, the same source from which he gets the bases for beautiful dyes. By boiling coal tar "crudes," he obtains various perfume substances at different temperatures. At 230 degrees, for example, he obtains a substance which, upon further treatment, yields the main component of rose water. Under a slightly different treatment, however, the same base substance supplies one of the main odor notes of jasmine. When the temperature goes to 392 degrees he distills off an entirely different chemical which is the base for artificial musk.

From oil of cloves the chemist obtains a chemical which has the delicate odor of carnation and the same substance, when further treated, becomes vanillin used, as the name implies, in vanilla. From oil of citronella, on the other hand, come parts of rose, lily-of-the-valley and lilac perfumes.

(Continued to page 142A)

GOING TO THE DOGS

(Continued from page 138A)

This gives rise to a multi-million-dollar industry in dog remedies, hospitals and surgery. It also has a great deal to do with the current revival of the veterinary profession. Dog dentistry is a coming profession. The most prevalent of city-dog ailments are constipation, intestinal parasites and pyorrhea.

The two most common dog operations are caesarian and stomach ulcer. As a rule, dog surgery rates range from forty to four hundred dollars. The modern dog surgeon works in a well-equipped operating room with the most modern instruments and sterilizers and uses anesthetics. The modern pet hospital has at least one qualified surgeon and assistant. There are now more than 400 such hospitals in the United States, at least nineteen dog cemeteries, a manufacturer of dog coffins and vaults and hundreds of dog monuments.

There's big money in dogs.

FREE SHIRTS, TIES and HOSIERY OFFERS TO CUSTOMERS

SELLING TANNERS NEW FALL SHOE LINE

For Men, Women, Children. Newest colored. Newest leather! Superior quality assures repeats. \$10,000 Gold Bond guarantees satisfaction. AMAZING FREE SHIRTS, TIES, HOSIERY OFFERS TO CUSTOMERS BRING LARGE ORDERS. Full range of sizes. Exclusive specialty featured! Extra profits getting orders for Men's and Women's Hosiery, Men's Shirts, Ties. Liberal bonus plan provides our representatives with FREE bonus shoes.

EARN BIG COMMISSIONS and

YOUR OWN SHOES FREE



LASTING FOOT HEALTH WITH SELF-ADJUSTING ARCH

Wonderful special inbuilt steel arch support exclusive with Tanners makes easy sales! Famous self-adjusting arch protector gives support to feet and entire body. Needed by hundreds in your territory!

WRITE AT ONCE Big selling season on. No experience or investment needed. We furnish all equipment FREE including big \$30 sample case of actual shoes. We pay postage. Send today for FREE OUTFIT.

TANNERS SHOE CO. BOSTON, MASS.

OUTFIT FREE



ALL-PURPOSE MOTO-TOOL

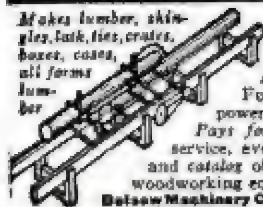
Does many jobs speedily, easily—grinds, drills, engraves, sharpens, routs, carves, polishes, etc. Universal motor—about 20,000 R.P.M.—plugs in any light socket A. C. or D. C. Handles as lightly as a pencil. Weighs 6 oz. and is amazingly powerful. Oilless—self aligning—ball thrust bearings.

TEN DAY TRIAL, satisfaction guaranteed or money back. 20 pc. general utility tool set \$5.75 extra. Send for Free Booklet.

DREMEL MFG. CO., 2822-CL, Racine, Wis.

ONE-MAN SAWMILL

Makes lumber, shingles, lath, ties, crates, boxes, casks, all forms lumber.



TURN TREES INTO MONEY WITH A BELSAW

Three capacities: 10, 14 and 20 ft.

Accurate set works positive dogs.

Full or one way type power feed runs on low power—Many owners use old auto engine.

Pays for itself quickly—thousands in commercial service, everywhere. Write for free lumber handbook and catalog of mills, supplies, tools, saw tables, and woodworking equipment.

Belsaw Machinery Co., 5110 J Davidson Bldg., Kansas City, Mo.

FARM MODEL \$49.00

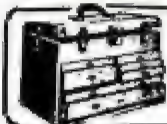
TWO BIG LEADERS GENUINE LEATHER TIES

NO SALES EXPERIENCE NEEDED. Beautiful 4-in. Bands for Men and Boys sell on sight. LOOK LIKE SILK; cleaned with a damp cloth. Famous Century Bands sell to uniform men, such as policemen, firemen, letter carriers, etc. Write today or send 5c for samples 4-in. Band Tie and Social Security Holder.

Inquire about our new **SOCIAL SECURITY HOLDERS.** Gold stamped fast seller

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You will appreciate the savings on tools when you protect them in this Chest. Free Catalog.

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New catalog of trailer parts at bargain prices. Drop center axle undercarriage, \$25, complete less tires. Utility trailer plans, 50c. Cabin trailer plans, \$1. Send for FREE Catalog today.

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RAISE GIANT FROGS FREE BOOK MARKETS WAITING!



Big frogs in big demand at good prices the year round! Easy to ship. We Buy! Sell us in sections in other waiting markets! Men and Women starting in every state and Canada! See what money you are doing. Small pond starts you. Free book explains beginners offer. Write

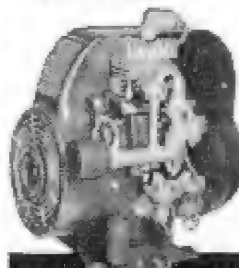
AMERICAN FROG CANNING CO. Dept. 131-TT. New Orleans, La.



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Run from gasoline or gas and generate electricity for Farms, Lake Cottages, Oil Stations, Commercial Places. A woman or child can operate it.



SIZES 350 WATTS AND UP

Each ONAN PLANT is a complete Unit, ready to run. No battery used except to start the engine. Easy to install. Available from stock. Direct Current Models 6, 12, 32 and 110 volt also available. Write for details.

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Saw-Filing

PAYS BIG!

An opportunity to earn up to \$2 to \$3 an hour in your own cash business. Start in spare time at home. No experience required. You can do expert work...easily, quickly, without eye-strain, with a

FOLEY AUTOMATIC SAW FILER



"I have filed 765 saws in spare time and have earned \$850.00 in carpenter work due directly to my saw filing contacts," says Louis F. Wadowick, Ohio. "Am still operating my Foley Filer after 5 years. Business better than ever this year," writes J. W. Veith, Pa.

The Foley files ALL kinds of hand saws, band saws and cross-cut circular saws BETTER than expert hand filing—every tooth exactly uniform in size.

FREE PLAN shows you how to start—no canvassing. Send coupon now—no obligation, no salesman will call.

FOLEY MANUFACTURING CO. 1016-7 Foley Bldg., 11 Main St., N.E., Minneapolis, Minn.

Send me **FREE PLAN**, for starting my own business in spare time filing saws on the Foley Automatic Saw Filer, without obligation to me.

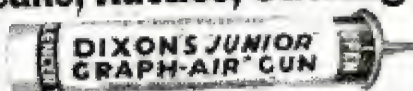
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SPECIAL EXTRA FINEST LUBRICANT IS DRY

Dixon's Microfyne Graphite Stops Squeaks, Rattles, Sticking

Use graphite applied with Dixon's 30 Graph-Air Gun and do what you cannot achieve with finest oils or greases. Graphite lubricates and stays put. It will not squeeze out, burn out or wash out. Stands extreme heat and cold, acids, alkalis. No gumming, no dripping. Fine for sticky locks and hundreds of other uses.



FOR STICKY LOCKS

USED BY EVERYBODY IN SOME WAY. A FEW OF MANY USES:

HOME—OFFICES—STORES... Locks, Clocks, Machines, Bicycles, Window, Furniture, File Case Slides, Office, Store Machines, etc.
SPORTS—SEA—AIR... Locks, Firearms, Fishing Rod Reels, Ferrules, Pulleys, Gaskets, Packings, Hare Boat, Bottoms, Airplane Gear Quadrants, Motors—see Auto Uses, etc.
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"JUNIOR"
This is a simple, when empty, it floats home. Model shown in application on display and instructions 30¢ card.

FACTORIES—RAILROADS... Locks, Tools, Gaskets, Threaded Joints, Machinery Bearings, Gears, Chains, Planes, Coin Devices, Linotypes, Alarm Boxes, Window Seats, FANES... Locks, Planters, Coating Seeds, Gaskets, Packing, Pipe Threads, Machinery, Pumps, Bearings, Gears, Chains, Field and Hand Tools, Motors—see Auto Uses. As hardware, auto supply, industrial equipment and sporting goods dealers or postpaid in U. S. A. on receipt of price (telegram and your dealer's name, if possible).

JOSEPH DIXON CRUCIBLE CO.
Dept. 26 C-G, Jersey City, N. J.

REFILLABLE Rubber GRAPH-AIR GUN

Long-lasting
filled—**75¢**
EACH



DIXON'S GRAPH-AIR GUNS
WITH MICROFYNE POWDERED GRAPHITE
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HANDY TAP and DIES . . .

Accurate—carefully hardened and tempered. Complete range of sizes at your local five and ten cent store.

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PRESS THE BUTTON, SIR!



SNAP-UP ELECTRIC GAS TANK CAP

Now you can eliminate the annoyance of losing gas caps and the expense of gasoline loss through theft. "Snap-Up" the ELECTRIC gas tank cap will pay for itself in a short time—will last for the life of your car.

Here is a well-made, reliable necessary that is not a gadget—for its action is simple, automatic and positive. NO BULKY KEYS for you to lose—no complicated mechanism to get out of order—STREAMLINE DESIGN—fits all cars. When the station attendant has filled your tank, he pushes the cap down and it LOCKS AUTOMATICALLY and POSITIVELY.

SNAP-UP GAS CAP COMPANY, ASHLAND, KENTUCKY
Incorporated

693

(Continued from page 140A)

The chemist's greatest single perfume achievement, however, has been the development of synthetic musk. Musk is the principal fixative used in perfumes and blends the various odors into one exalting scent. The powerful, sweet odor of musk is said to be more fascinating than any other to humans and in its natural form the substance is obtained from the glands of a male deer in Tibet. In its impure state, it has sold for \$560 a pound, about the present price of gold. It cannot be had in a pure state, but if it could, it would be worth about \$40,000 a pound.

Chemists of the du Pont company developed a synthetic musk as powerful as the essence of the natural kind. Artificial musk also is produced chemically and has a similar odor but discolors some compounds. Synthetic musk does not.

There is nothing revolutionary in covering up unpleasant odors with pleasant ones as industry is doing. Housewives have been doing the same thing right in their kitchens for years. They burn incense to overcome the smell of boiled cabbage, cook vinegar in pans in which fish has been cooked and they first used caraway seeds, not for the flavor they gave to bread, but to cover up the odor of cheap ingredients. And if you eat a clove after indulging in onions, you apply the same idea.

Perfume in soap serves a double purpose. It covers up the unpleasant odor of fats and also provides a pleasant odor. Every cosmetic and soap today is perfumed but until synthetic perfumes were developed, only a few odors such as lemon, lavender, bergamot and orientals were used in soaps because the cost was prohibitive. Now the use of synthetic aromatics permits the reproduction of even the most expensive new bouquet odors in soap.

"Odors are bound up with our instincts," says George B. Bradshaw of the fine chemicals division of the du Pont company. "Our sense of smell exerts a powerful influence on our other senses. Taste and smell complement each other and we all know odors affect our appetites. We like the perfume of flowers instinctively but we also react to other odors which are not perfumes in the ordinary sense but which, perhaps, recall pleasant memories. Most of us like the smell of fresh bread—cer-

(Continued to page 146A)

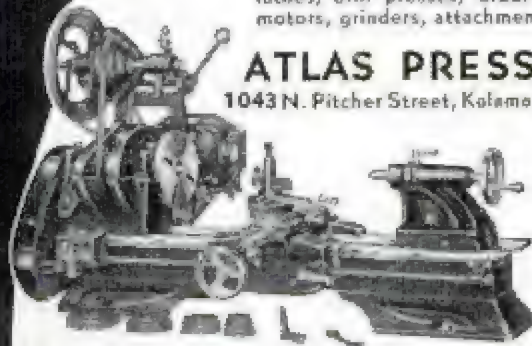
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"It's the sweetest running lathe I've ever seen... every inch designed to do a better job. Has complete V-belt drive, built-in countershaft, and 16 speeds with gears to cut hundreds of threads. For real value, take it from me, get an Atlas."

Send for free catalog showing Atlas lathes, drill presses, arbor presses, motors, grinders, attachments.

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TYPEWRITER 1/2 Price

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Only 10c a Day

Save over 1/2 Mfr.'s Origl. Price on all standard up-to-date office models.

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Remainder payable on all late models complete returned like new. FULLY GUARANTEED. Big Free Catalog shows all makes in full colors. Send postcard for lowest prices.

SPECIAL PORTABLE BARGAINS—

Brand New FEATHERWEIGHT—Largest Model Portable—up-to-date streamlining features—now offered at amazing low price. Fully Guaranteed—10 day trial—only 10c a day. Full details sent free!

Free course in typing included.

International Typewriter Exch., Dept. A-1001, Chicago



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New Adding Machine Fits Vest Pocket!

Adds, subtracts and multiplies up to one billion. Weighs only 4 ounces. Not a toy—strong guarantee. Absolutely accurate, very fast. Sells easily to offices, stores, homes—wherever figures are used. Write quick for FREE sample offer and Money-Making Plan.

VE-PO-AD Co., Dept. 91, 303 W. Monroe St., Chicago

Costs only \$2.95

NEW 1/4-inch JUNIOR DRILL \$19.95

Write for Details

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610 Penna. Ave., Towson, Maryland

BUILD THESE PROJECTS

For garden or lawn. Easy to build. Easy to sell. Detailed Blueprint Model B-25 Dutch Windmill Mfg. Model OM-6-1 Gal Mill \$4.00. Lawn Figure Putters—Sunbambet Girl, Dutch Boy, Tulip Girl, Holland Girl \$5 each. 4-41 001 Catalog illustrating over 25 models, send 10c today.

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National Paint Spray Units suitable for all purposes. 5 Sizes, \$14.50, \$22.50, \$32.50, \$47.50 and \$98.50. Air Compressors all Sizes up to 34 C. F. M. Best value money can buy. Send for free folder. NATIONAL ELECTRIC TOOL COMPANY, Dept. 10, 560 West Washington Boulevard, Chicago, Illinois.

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EDGED TOOLS AS I AM ABOUT
TUBA PLAYERS"
... says DON VOORHEES

Nationally known
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● Every craftsman is fussy about his tools. Sharp tools are one of the secrets of good craftsmanship. It's easy to keep tools razor-sharp with a Carborundum Brand Sharpening Stone. The combination stone, for instance, has a coarse and a fine side. One side brings the tool to an edge, the other hones it to razor-like sharpness. And for your grinding jobs, two types of wheels are available—Carborundum Brand Silicon Carbide for general grinding, and Alloxite Brand Aluminum Oxide for tools and special grinding jobs. A wide variety of sizes and grits are available to meet every sharpening and grinding need.

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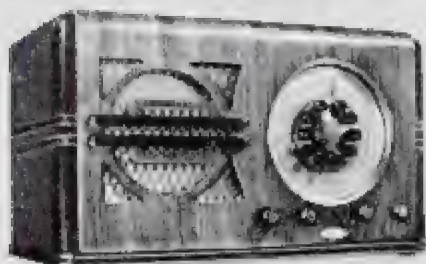
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CARBORUNDUM
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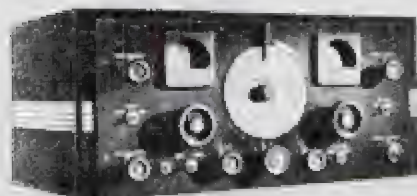
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Automatic Tuning, powerful performance and rich tone are the outstanding features of the new KNIGHT Radios. 5 to 16 tubes, for AC, AC-DC, 6 Volt, 32 Volt, Battery and Auto operation. Beautiful Console, Chairside, Phono-radio, Table and Chassis models.



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12,000 RADIO PARTS!

The 1938 ALLIED Catalog offers a tremendous assortment for building or repairing any circuit. It enables you to spot the part you want—conveniently, quickly, accurately!



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KNIGHT "Integrated" P. A. Systems from 8-60 watts—portable, permanent, and mobile—for 110 Volt, 6 Volt and Universal operation. P. A. for every need!



68 NEWEST TEST INSTRUMENTS!

Here's Radio's most extensive line of test instruments—new 2" Cathode Ray Oscilloscope, Oscillographs, Analyzers, Tube-Checkers, Set-Testers, Meters, etc.

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BRINGS YOU THESE
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WRITE FOR ALLIED'S NEW 1938 CATALOG— RADIO'S LEADING SUPPLY GUIDE!

Send for this great book today—164 big pages packed with Everything in Radio! Thousands of parts, dozens of radio sets, kits, Public Address systems, Amateur receivers, test instruments, books, tools, etc.—at money-saving prices. It's new, complete, and entirely different from any other radio book ever published. Make your radio buying easier and more profitable—write for your FREE 1938 ALLIED Catalog now—it's Radio's easy-to-read, easy-to-shop, easy-to-order-from book!

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WITH THE NEW FLEXARC MIDGET MARVEL



Why pay others to do your welding? Take a tip from hundreds of profit-making shops. Do your own welding. Save money... give your customers better jobs, quicker service... with the complete easy-to-use FlexArc MIDGET MARVEL... the only "BIG-TIME" low-priced a-c. welder.

Amazingly easy to operate, the FlexArc Midget Marvel welds all metals and alloys from heavy motor blocks, castings, and truck frames to fenders and light sheet metal down to 22-gauge.

Startlingly Low Welding Costs: Only 8¢ per hour (based on 3¢ per kw-hr.) at the maximum welding current of 140 amperes.

Weights just 112 pounds. Measures only 11 by 14 by 18 inches. The FlexArc Midget Marvel can be carried easily in the back seat of a car ready for instant service wherever 110 or 220-volt a-c. power is available.

Westinghouse

Westinghouse Electric and Manufacturing Company
Room 7-N, East Pittsburgh, Pa.

Without obligation, have your representative call with complete information on the new FlexArc Midget Marvel Welder.

Name _____
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EVERYTHING YOU NEED TO START WELDING IMMEDIATELY

GUARANTEED BY WESTINGHOUSE

Built in the largest works in the world devoted exclusively to the manufacture of electric machinery, the FlexArc Midget Marvel has been in it 15 years of Westinghouse production experience.



FREE FALL CATALOG

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Showing Hunting Footwear, Clothing, and forty other leather and canvas specialties of our own manufacture for campers and hunters.

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Ride 4 Miles for 1¢
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120 MILES per Gallon



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STUDENTS: Discover for yourself the amazing thrill and economy of Auto-Gliding! One-tenth the expense of a car! 4¢ a mile—cheaper than shoe leather! Worlds of sport—makes you the envy of every student. Just tow books or packages into the big parcel carrier... step on the starter... release the clutch—glide safely, 20 miles an hour, to your destination. Thousands—in every state—used for deliveries, shopping, to school or work, pleasure spins, etc. Very ruggedly built—heavy-duty 1 or 1½ H. P. Cushman engine, strong channel steel frame, large balloon air tires, comfortable cushion seat, light horn, brake, etc.—with or without carrier.

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FREE BOOK! See your local Auto-Glide dealer at once—or write direct to factory for free illustrated book with complete details.

DEALERS: Investigate the profits many dealers are making with Auto-Glide. Dealerships going fast. Get Special Offer!

THE CUSHMAN MOTOR WORKS, Dept. A-10, Lincoln, Neb.

(Continued from page 142A)

certainly not a perfume—the smell of fresh earth and dozens of other odors which cannot be classed as perfumes.

"But the perfumer, who mixes odors as though he were mixing colors, must consider these instinctive likes and dislikes when he develops a new scent. If you hear a new song and it is reminiscent of other songs you have liked, you probably will like the new one, too. In the same way, if a new organic material has an odor reminiscent of one or more which most people like, it has perfume possibilities."

The development of a wide range of synthetic perfume materials has led to the making of specific perfumes for specific purposes. You can have your own perfume blended to match your personality, and special perfumes are being produced for men only. Most of the latter have a soft, herby odor not popular with women or are of a resinous type and not obtrusively sweet. You will find them in shaving creams, lotions and powder for men.

The most valuable perfume as far as universality of use is concerned is probably oil of bergamot. The price of this is controlled by the Italian government, and the cost has recently been tripled or quadrupled. From the standpoint of rareness, the most valuable perfume material is ambergris or perhaps musk Tibet, both of which have brought \$1,000 a pound.

In creating synthetic perfumes the chemist, as in other fields, has done more than merely reproduce nature's handiwork. He has developed brand new perfume materials, odors and fixatives not found in nature. By finding ingredients free from some undesirable characteristics of natural oils, he has removed some of the restrictions of blending, thus making possible a whole new realm of perfume effects.

Through the creation of new raw materials the chemist thus has brought new fragrance and beauty into the lives of everyone. And within the next few years this is likely to become an even more pleasant world for your nose because, despite the progress which has been made, the perfume possibilities for the future are almost unlimited. New applications for perfume are being found daily, new materials are being discovered, new scents are being developed. To paraphrase a slang expression, "You ain't smelled nothin' yet."

A World Easy on Your Ears

(Continued from page 557)

"Microphones and amplifiers indicate there are many sounds in nature which we can't hear because of their high pitch," says A. J. Muchow, acoustical engineer for the General Electric company. "During the world war police dogs are said to have been called with whistles inaudible to humans and many insects are known to produce sounds beyond our hearing range.

"To be audible, sound must be produced by a vibrating body big enough and moving rapidly enough to produce positive compressions and rarefactions—or waves—and it must possess enough power to stimulate the auditory nerves, the power

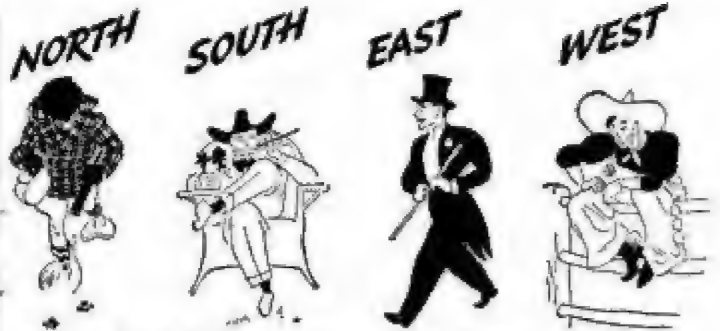


Using sculptor's clay to find means of reducing sound of wind blowing on windshield

required depending greatly upon the pitch. While sound moves outward from the source of vibration at 1,100 feet per second or 750 miles an hour, the distance any individual air particle travels to and fro is about one and one-half millionths of an inch for a moderately loud sound.

"Intensity is a measure of the power of sound; loudness is the magnitude of auditory sensation. The acoustic power generated by the source of even a very loud sound is usually quite small. If everyone in this country were to talk at once in ordinary tones, the power actually converted into sound would about equal the power required to operate one 100-watt lamp.

"You recognize a friend's voice by its quality. The quality of sound depends upon the number, relative intensities and pitches of the various tones present. And the recognition of the quality of a noise often gives the sound expert a clue which leads to its source. If the frequency, or pitch, and the magnitude of the various



Men look better—Feel better, too, in

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WHEREVER you are—whatever you're doing—you'll look better—feel better, too, in The Bracer!

This new-type supporter belt—is the favorite of men everywhere. A Bauer & Black product, The Bracer is scientifically made of the finest materials, under the most sanitary conditions. Bauer & Black, the world's largest manufacturers of athletic supporters, have made in The Bracer the world's finest supporter belt. So don't accept substitutes!



Only The BRACER has these 4 exclusive features

- 1 Fly front
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- 3 Made of "Lastex" yarn
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Look for The Bracer label

The Bracer is knitted from two-way stretch "Lastex" yarn with four removable ribs to prevent rolling and an exclusive fly front for convenient all-day wear. No buttons or buckles to bother you.

Try The Bracer today. On sale at department, drug, haberdashery and sporting goods stores.

THE BRACER

If your dealer cannot supply you with The Bracer, simply fill out and mail this coupon with a check or money order. Price \$2.00 (Canada \$2.75).

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Name _____

Address _____

City _____ State _____

My dealer's name and address is _____

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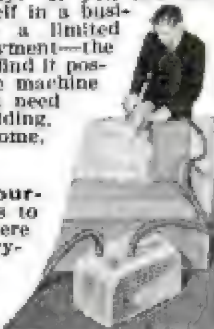
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You are ready to go to work the minute you get the outfit, so you ought to be taking in big profits the first day. We want an honest, ambitious man in every locality. If you are that man we will help you get started for yourself in a business with tremendous possibilities. Only a limited amount of money is needed for a down payment—the balance you send on easy terms. Most men find it possible to make far more than the cost of the machine before the payments come due. You don't need to rent a shop—you don't have to hire a building, for the work is done in your customer's home.

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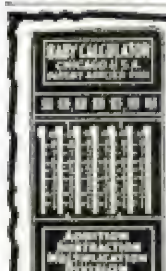
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tones given off by a machine are determined, the particular parts producing a noise usually can be located."

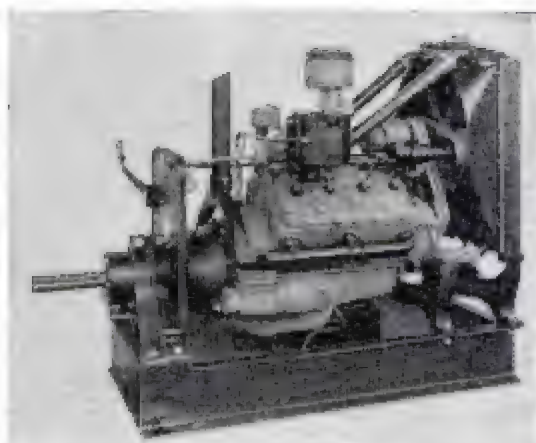
When sound waves encounter obstacles, the energy is reflected, transmitted or absorbed. The reverberation of sound in rooms, the roll of thunder, the passage of sound through speaking tubes, echoes, whispering galleries and even the "ocean's roar" heard in a sea shell—or a glass tumbler—all are examples of sound reflection which occurs when a sound wave encounters a medium of different elasticity or density, thus diverting some of the energy. The echo of a shout directed at a cluster of trees often returns at a higher pitch, an example of selective reflection. The lower frequencies pass through the cluster, the higher are returned by reflections.

Sound reflection has been employed experimentally to remove smoke particles from the air. The smoke is passed through a cylinder closed at both ends and sound waves are produced by a steel rod fixed in one end and vibrated electrically. As the sound wave is reflected back and forth through the cylinder, there are points where the initial wave and reflected waves meet and cancel each other. Here the smoke particles are compressed into layers and coalesce into larger grains and settle, thus removing them from the air. Canceling energy of one sound wave with another in this manner gets rid of some noises.

If you've ever heard what appeared to be a rattle in the steering wheel of your car, and found it disappeared when an adjustment was made up near a front wheel, you've had an example of the spreading of sound by internal reflections through connected metallic parts of a machine. Sometimes sounds spread this way through the steel portions of a building. Then the sound man is likely to acquire quite a headache before he traces the sound to its lair. If you've heard the approach of a train through the rails before the sound reached you through the air, you've had an example of internal reflection in which the sound was turned back at the boundaries of the metal and thus confined to the rails. To find the source of this sound, the engineer would have to find the train, perhaps a mile or more distant. But the job isn't much simpler when internal reflection pops up in a compact machine with

(Continued to page 150A)

LOW COST POWER



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Here's dependable, low-cost power up to 60 H.P.—complete, compact, portable. Ideal for line shafts, welders, compressors, hoists, pumps, amusement devices, well drillers, agricultural, oil field and contractors' equipment, etc., etc. The most complete industrial power plant built. Uses gasoline or natural gas.

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(Continued from page 148A)

hundreds of parts, each under suspicion.

Sound is absorbed when the obstacle it encounters is composed of material containing crevices which dissipate the energy through friction. Sound-absorbing materials like cotton waste and mineral wool, when properly used, may absorb as much as ninety per cent of the sound energy so they are valuable in eliminating noise where the source itself cannot be eliminated. The engineer cannot get rid of all the annoying sounds of an airplane, so he insulates the cabin to prevent the noise reaching the ears of passengers.

Sometimes resonance occurs when applied forces or sound vibrations and the natural vibrations of some medium happen to be in unison. Many musical instruments depend on this action, resonance in loudspeakers affects the quality of radio music and resonance in your car causes noise at certain speeds. It is often very difficult to design a machine so some of the many forces acting will not coincide in frequency with the natural period of certain parts and excite them into vibration. Combating resonance in machinery is one of the jobs of the sound engineer, and the battle starts when the machine is being designed.

If an obstruction is porous, some of the sound energy passes through the pores, part of the remaining energy sets the particles of the obstruction in vibration and starts new sound waves and these, in turn, travel through the material to the further side and set up still more sound waves in the surrounding air. If the obstruction is a thin, flexible wall, the entire surface may vibrate in response to a sound and thus transmit energy by setting up more sound waves on the opposite side.

With the "electric ear" and similar instruments, sound experts find it possible to determine what levels of sound are acceptable or comfortable in the home, the office, the workshop and the street. And in designing machines to come within comfortable sound limits, manufacturers have found that they not only increase sales but also increase the efficiency of their equipment. As we gain a fuller knowledge of how sound is produced and transmitted, we may anticipate the day when we will have complete control of noise. Then we will have a world of truly comfortable peace and quiet—a world easy on the ears.



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Complete Construction Kit containing Fully Carved Wood Hull Stamped Balsa Decks Life Boats Anchors, Riggers, Chocks, Steering Wheel (all cast metal) Chains, Masts and Spars, Sail Cloth, Rigging, Cement, Colored Lacquer, etc., with Full Size Plans.

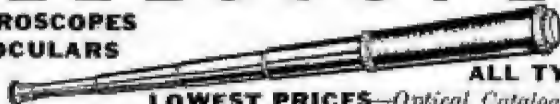
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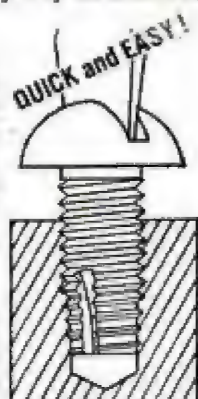
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Three Test Meters in One Unit

(Continued from page 577)

mit measurements of resistance up to 100,000 ohms. The 50-ohm resistor is a precision type, all others are Continental semi-precision carbon resistors.

Hook-up details appear in Fig. 1, and photo Fig. 1-A. All black "banana-type" pin jacks are negative returns; for resistance measurements the yellow and black jacks are used. The No. 2 switch marked HI-LO must be set for the reading desired; if a resistor under 1,000 ohms is being tested, the switch is set down on LO, if above 1,000 ohms it is thrown up on HI. When the resistor jacks are not in use, the switch must be set in the HI position to conserve the battery. All blue jacks are the positive connections for voltage measurements, and the red jacks are used for measuring current, as indicated in Fig. 1-B. The lower red jack connects directly across the meter and is used to measure d.c. current of 0 to 1 m.a. A dual shunt resistor provides for the 10 and 100 m.a. current ranges; the "on-off" switch No. 1 places the shunts in or out of the circuit and must be in the "off" position for all other measurements.

Audio Stage for One-Tube Set

(Continued from page 580)

inal set, short wires are run between the headphone terminals and the input posts of the amplifier. The headphones are then shifted to the Fahnestock clips on the opposite side of the amplifier baseboard. It is important to use low-resistance headphones in order to avoid excessive voltage drop. A single 1,000-ohm headphone unit is recommended; a small magnetic speaker can be used on local stations.

For the information of those who did not build the original set, the coil is wound on a short length of cardboard tubing. The original form used was the cardboard cover of an old type—"U1" flashlight cell. A complete list of materials and operating instructions can be obtained from Popular Mechanics radio department without charge. The original blueprint number was R-227, and this now includes the amplifier diagrams. Figs. 1, 2 and 3 show coil-winding data and both units connected. Figs. 3-A and 3-B are photos of the completed units.

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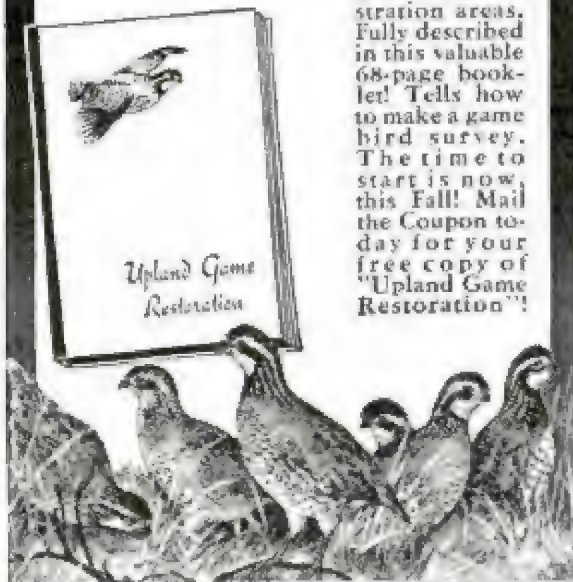
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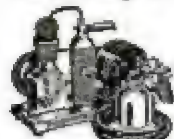
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Diving Goes Modern

(Continued from page 511)

nourishment had to be considered. The lunch goes down with the gear. A tube picked up inside the helmet by the mouth provides substantial liquid food. Honey, malted milk and concentrated soups are the most easily assimilated heat and energy-producing foods for this purpose.

There are numerous means of communication with the surface or between divers. A speaker and microphone are built into the helmet so that two-way voice communication may be carried on over a telephone line. The usual signals over the life line, a code of pulls over a rope snapped to the helmet, may be used. Many times, however, particularly in wreckage or currents, the diver will want to be completely free of all entangling lines and yet will want communication. A midget radio combination transmitter and receiver has been developed to fit into the helmet. The diver can carry on a conversation with the tender on the surface or with other divers. There also is a supersonic signaling system, which will allow the diver to communicate with his tender or another diver at any time by means of the transmission and reception of a sound wave through the water.

The leaden shoes and emergency weights are about the only items we have made no attempt to improve upon. The entire Craig-Nohl gear packs in a copper-covered box, which contains a fitting and a place for every piece of equipment, so that, once on location, everything is accounted for and ready for diving. The diver quickly slips into the dress, puts his head in the helmet, a clamp is tightened, a boom or purchase picks him up and drops him into the water, and he is on his way to the world beneath.

Capt. Craig is not only interested in reclaiming from the sea its long-guarded treasures, he is attempting to bring back motion-picture records of his unusual experiences in the strange, fascinating and fickle world of water. Among his many items of equipment are his own specially designed diving cameras. These are semi-automatic; cranked with motors, and can be started at will by the diver. They are equipped to overcome the reflection problems long bothersome in underwater photography.



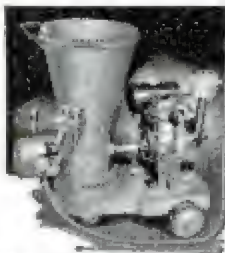
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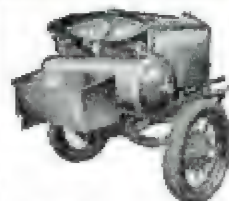
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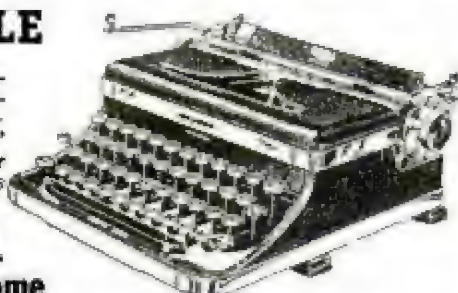
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Bent Beams Speed Blind Landing

(Continued from page 483)

ing instruments. The first of these planes will be delivered in 1938. Coincident with this installation in the new air liners must be installation of ultrahigh frequency beam transmitters at principal airports.

Of the approach systems in existence today two are being used by air lines for actual work in training pilots and checking results of innumerable blind landings. One is the Lorenz system, developed by the German subsidiary of International Telephone and Telegraph Corporation and it is in use at present by nine foreign airways in thirteen foreign countries. The system has been installed at the Indianapolis, Ind., airport where American Airlines is conducting flights. United Air Lines and Transcontinental & Western Air are conducting flights at Oakland, Calif., using a system of domestic origin. The Oakland system was an original installation of the United States department of commerce.

A flight "under the hood" without sight of land or sky in either the American Airlines plane at Indianapolis or the United Air Lines plane at Oakland would reveal that both systems are fundamentally the same. In the cockpit of both planes is a blind-flying indicator set into the instrument panel and connected to a special radio receiver. Visible in the United Air Lines plane is a glass-encased dial studded on either side with a small electric light bulb and with two needles showing in the face of the dial. This forms the heart of the system in the ship. The two needles are the visual indication of when the plane is riding the glide path beam down to earth and when the plane is centering over the runway. Ultrahigh frequency waves sent out by the ground equipment and received through a special antenna in the ship's nose operate the needles. One of the needles points straight up, showing relation of the airplane to the center of the runway. The other needle points horizontally and when dead center of the left-hand side of the dial indicates the airplane is following the glide path. The two lights spaced on each side of the dial flash when the marker beams are entered.

When approaching for a blind landing the pilot of the United plane first picks up

(Continued to page 158A)

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(Continued from page 156A)

the directional beam which comes wedge-like from the airport runway. When he does this the vertical needle jumps up and centers at zero. He may pick up the runway beam fifteen or more miles out. Proceeding at approximately 1,500 feet altitude, he sees the horizontal needle jerk and hang center, so he knows he is on the glide path. At about that time he hears a loud, deep hum in his radio headset and sees a light flash on the left-hand side of the dial. These visual and audible signals, forming a double check, inform the pilot he has passed the first marker and is five miles from the airport.

Both needles now register zero. They are crossed like the hairs of a rifle sight. At this point the pilot turns on the gyro-pilot and while the plane is being flown automatically, he concentrates on the two needles. At no time does he see the ground. Adjustments to keep on course and to maintain just the right rate of descent for the glide path are accomplished by fingertip operation of the gyro-pilot. Manual controls of the plane are not used. Shortly, the passing of the second marker beam is indicated to the pilot by the higher-pitched hum in his headset and the flashing of the second light. He is now only 300 feet above the surface and nearing the runway at ninety miles an hour forward and 300 feet a minute downward. His wheels touch the ground with a jar. Shock absorbers take up the force of the blow and brakes are quickly applied.

If the pilot had been flying the Lorenz system, as revised for domestic use, in an American Airlines plane, the main difference would have been that instead of needles for an indicator, there would have been a cylindrical gauge that swung around to zero to indicate the glide path and one downward-hanging needle to show on course. Ground equipment of the two systems is very similar. Each has two transmitters, connected with a master control. One sends out the glide path and the other the runway beam. The glide path, transmitted at ninety-one megacycles, is started out a few inches above the ground, and at the center of the airport it is only four feet above surface. At the edge of the airport it curves upward and hangs sixty feet above the surface. The runway beam also is extremely accurate.

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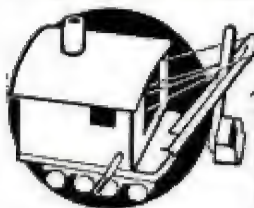
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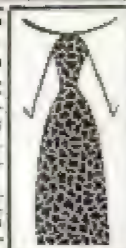
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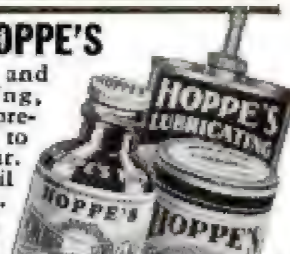
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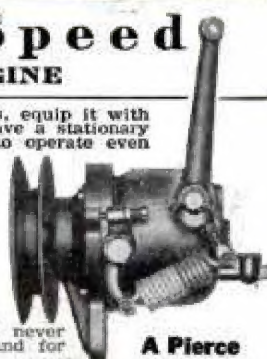
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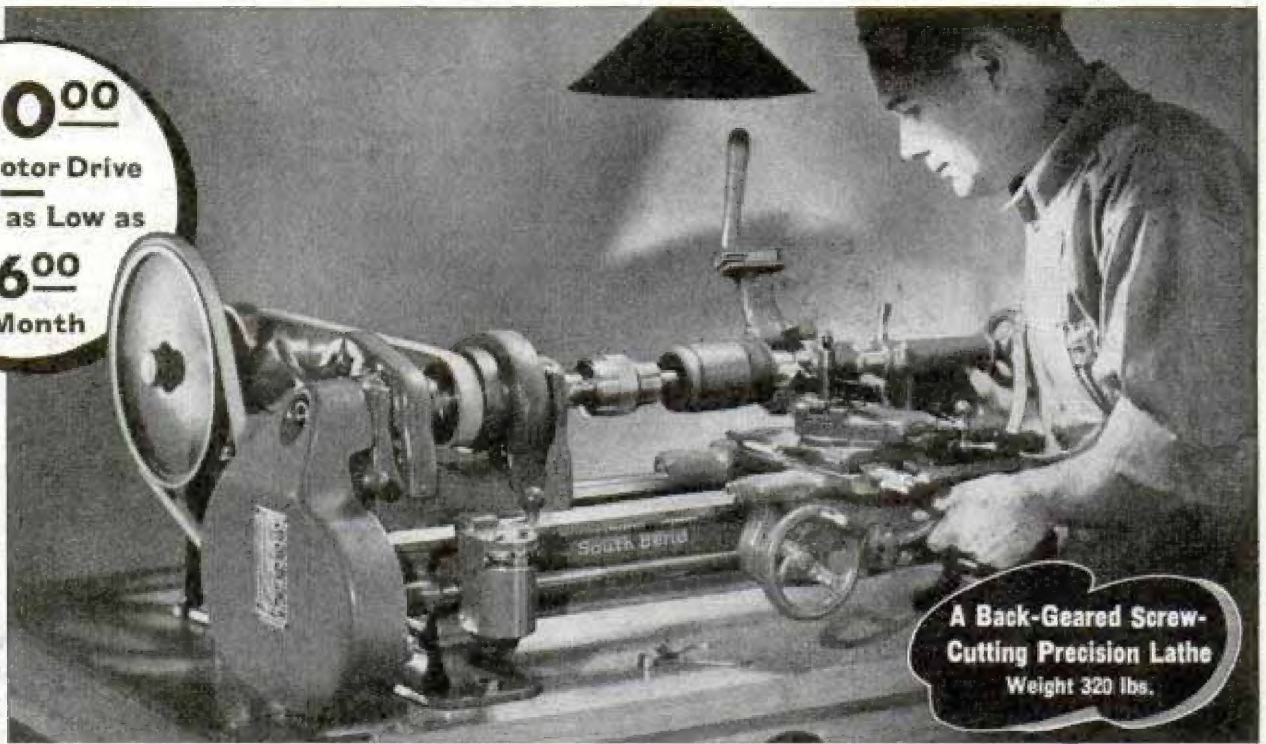
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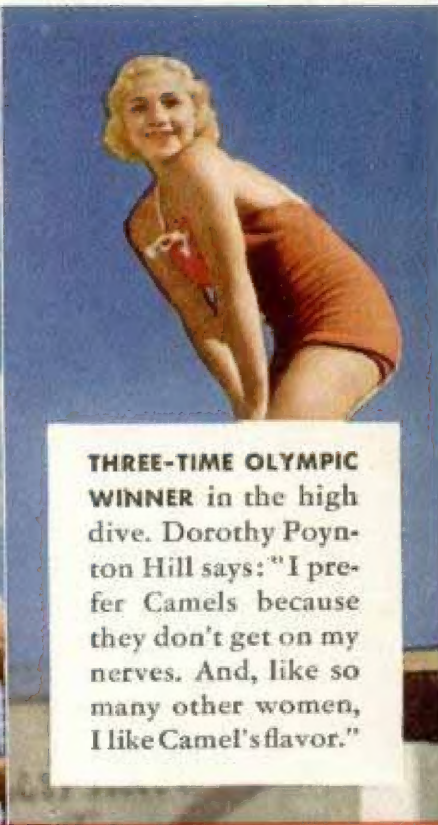


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(Left) **LENORE KIGHT WINGARD.** She has broken 7 World's Records—16 Nat'l Records—in speed swimming. Lenore comments on smoking: "Camels are certainly mild. They never jangle my nerves."

(Right) **HAROLD "DUTCH" SMITH,** who holds Olympic diving championships, says: "I've found great pleasure in Camels. I long ago found Camels restore my energy after a strenuous meet."



(Left) **PETE DESJARDINS**—internationally famous diver—speaking: "Divers like a *mild* cigarette that doesn't upset nerves. That's why I prefer Camels."



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